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Morley's Patent Railroad Track Chair.

Above are engravings of a new rail joint chair, of more than ordinary merit, for which letters patent were granted to James H. Morley, of St. Louis, Mo., on the 2nd of December 1856.

Figure 1 is an end elevation. Figure 2 is a perspective view *from below*, and figure 3 a longitudinal section on the line S S, in figure 1. The chair has been proved to be extraordinarily effectual in holding the ends of the rails perfectly stiff, so as to make the strength and elasticity of the track as perfectly continuous as possible, and although its expense, (some 70 or 80 cents per chair) is considerably greater than any of the common cast iron, or even than the most approved continuous lip wrought iron chairs, it is far less than the elaborate fish joints employed on some heavily worked roads.

A A are the rails to be joined. H H shows a chair in place, composed of two parts, one on each side the rail. D D are bolts passing through each part closely underneath the rails, drawing the two parts of the chair together by means of the nuts, R, causing the parts of each, which we may term the lower and upper jaws, B B and C C, to grip firmly the flange of the rail on its top and bottom, the chair not touching the edge of the rails at F F. The upper face of the lower jaw, B, is slightly convex in its longitudinal section as shown in figure 3, and the lower face of the upper jaw is correspondingly concave, giving to the joints a tendency to rise slightly as the two parts of the chair are drawn together by bolts, D, and also preventing a too rigid gripe of the guides on the rail. The upper jaw touches the rails only at the ends of the chair, and the lower jaw touches them only in its center, on the ends of the rails, as shown in figure 3, so that the elasticity of the rail thus eases the jaws from their gripe, when the load is near the center of the rails, and allows the rails to move longitudinally in the chair at that moment, as changes of temperature may require. The rails are notched near the ends in the usual manner, and lugs or stops not represented are cast in the chair on the inside to fit the notches to prevent the rail from working out of the chairs; E E are notches where the chair is spiked to the cross tie or wooden sleeper of the track as usual.

The bolts, D D, being below the jaws, act as a fulcrum in a manner to cause the jaws to bite the rail the harder while the load is on the joint.

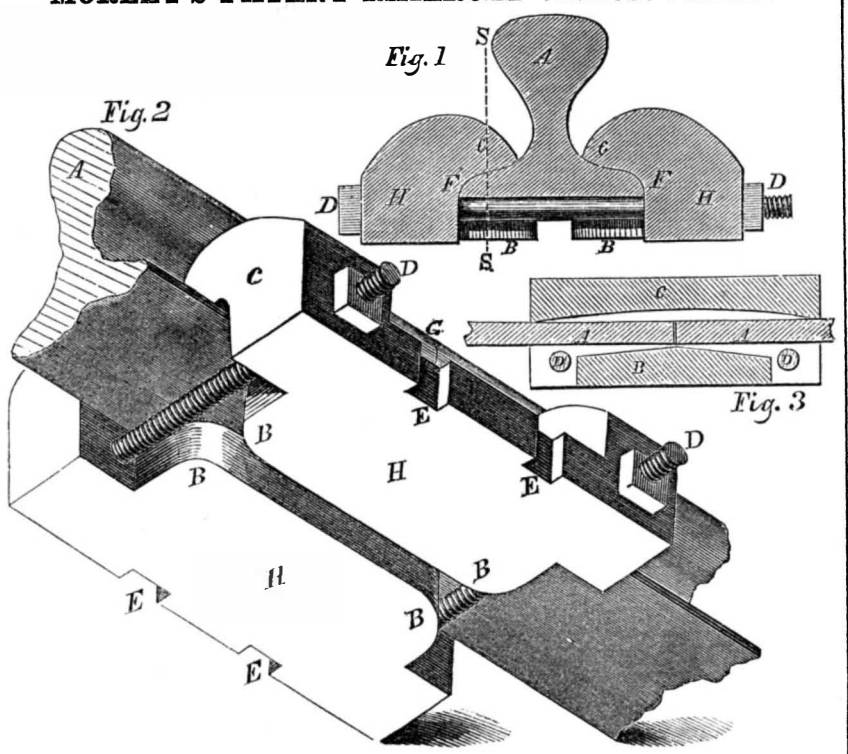
The form given in the drawings is of a cast iron chair that has been in actual use on several miles of road during the past nine months, the exterior may by suitable machinery be made of wrought iron, if preferred.

The chair has been successfully used to some extent by placing the joints between the cross ties, so as to leave the chair altogether unsupported and free to spring like other parts of the rails. The external form may be changed with economy when thus used.

Experience and the opinions of some of the most prominent practical railroad men, lead to the belief that this makes one of the best joint fastenings in use. It effectually braces the joint so as to prevent its settling under the weight of the heaviest engine, and this, too, on an unballasted road bed. The battering of the ends of the rails, which takes place with most chairs now in use, is effectually prevented by this one, as it renders any considerable working or sinking of the ends of one rail below its fellow impossible. These advantages, together with its cheapness and the ease with which it can be adapted to old tracks of whatever pattern of rail, recommends it to the attention of railroad companies.

Further information may be obtained by addressing the patentee as above, or Samuel Small, Esq., Boston, Mass.

MORLEY'S PATENT RAILROAD TRACK CHAIR.



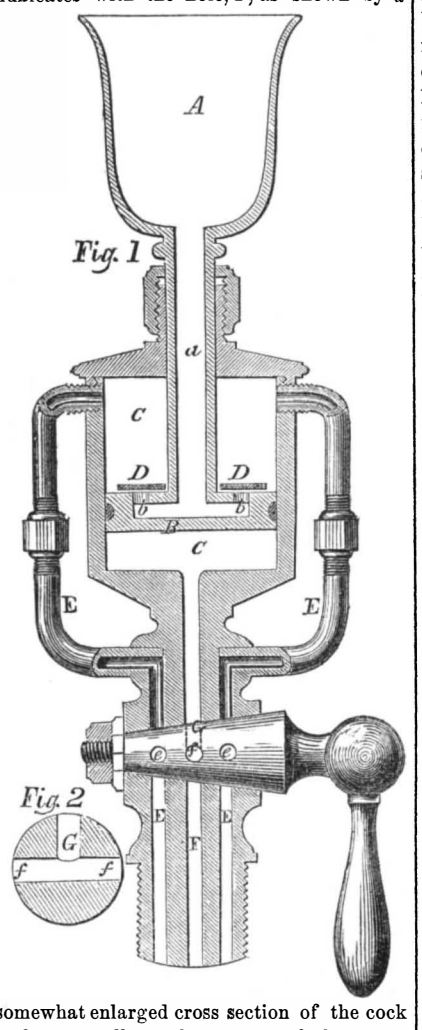
Henwood's Lubricator.

Various devices for feeding oil into the steam chests and working cylinders of steam engines to lubricate the valves and piston by the aid of two cocks, hand pumps, etc., have been adopted at various times, and many steps toward perfection have gradually been attained.

The accompanying cut illustrates an excellent device for the purpose, invented by Mr. John Henwood, of this city, being an improvement on his lubricator patented March 10, of the present year. It works with a single cock, and injects the oil very certainly and speedily by simply turning the said cock one fourth of a revolution. It is only applicable to engines in which a tolerable pressure of steam is employed, as it might be liable to fail under pressures of only from three to ten pounds above the atmosphere, as are employed in some English engines.

A is a small cup or funnel, in which the oil is poured. *a* is a smooth tube connecting A to B, which latter is a hollow piston. *b* are holes in the top of B, and D is an annular valve of thin metal. The oil poured into A, descends into B, and lifting D, rises into the cylinder, C. The cock represented in the stem below this cylinder, is the only one employed, and the construction might be still further simplified by dispensing with one of the two passages E, but we will proceed to describe it as now constructed. The passages, E, lead from the top of C, and the passage, F from the bottom. By turning the cock quarter round, the holes, *e e* and *f*, coincide with and continue the passages, E E F, so that the pressure of the steam is immediately felt on both sides of the piston, B, but as the tube, A, is of considerable area, and of course prevents the piston from feeling any other than the atmospheric pressure on that part, the pressure on the under side is so much greater than on the upper, that it rises and drives the oil through the passages, E E, into the steam chest or other part to be lubricated.

The piston, B, is now nearly at the top of the cylinder, C, the slight space above it being filled with oil, and the whole cavity below with steam at full pressure. But by turning the cock back to the piston represented in our engraving, the hole, G, therein (which communicates with the hole, F, as shown by a



somewhat enlarged cross section of the cock in figure 2) allows the escape of the steam from the lower portion of C, through a side opening, and both sides of B being now subject only to the ordinary atmospheric pressure, it descends by gravity to its first position ready for a repetition of the operation; or in case the friction should chance to prevent its spontaneous descent it can readily be forced down by a slight pressure with the spout of the oiler when it is next used. We consider the apparatus a cheap and very convenient means of lubricating in every case where the entrance of the oil is resisted by any fluid at a considerable pressure.

For further information address the inventor, in care of Messrs. Mollers, Shotwell & Docher, sugar refiners, corner of Vestry and Washington streets, this city.

Turkish Cement.

The Turks use common red earthenware pipes with socket-joints, to convey water from springs to reservoirs and fountains. They make and use mortars and cements as follows:—

Mortar.—Fresh slacked hydraulic lime, one part, by measure; pounded brick or tile, finely sifted, one part, by measure; chopped tow sufficient to mix into the consistency of ordinary hair mortar. The ingredients are mixed dry immediately before use, and then well incorporated by the aid of water; the mortar is used fresh.

Cement.—Fresh slacked hydraulic lime, one part, by measure; pounded brick or tile, finely sifted, half part, by measure; chopped tow as above. The whole is mixed with oil, in place of water. The earthenware pipe-joints are made water-tight with this cement.

Hard Cement.

The following cement has been used with great success in covering terraces, lining basins, soldering stones, &c., and everywhere resists the filtration of water. It is so hard that it scratches iron. It is formed of 93 parts of well-burnt brick, and 7 parts of litharge, made plastic with linseed oil. The brick and litharge are pulverized; the latter must always be reduced to a very fine powder; they are mixed together, and enough of linseed oil added. It is then applied in the manner of plaster, the body that is to be covered being always previously wetted with a sponge. This precaution is indispensable, otherwise the oil would filter through the body, and prevent the mastic from acquiring the desired degree of hardness. When it is extended over a large surface it sometimes happens to have flaws in it, which must be filled up with a fresh quantity of the cement. In three or four days it becomes firm.

Drawing a Magic Circle.

Reuchlin, an Austrian sage, was once detained in an inn when it was raining very heavily, and, of course, had a book with him. The rain had driven into the common room a large number of persons, who were making a great noise. To quiet them, Reuchlin called for a piece of chalk, and drew with it a circle on the table before which he sat. Within the circle he then drew a cross; and also within it, on the right side of the cross, he placed with great solemnity a cup of water; on the left he stuck a knife upright; then placing a book—a Hebrew one—within the mysterious circle, he began to read, and the spectators who had gathered round him, with their mouths agape, patiently waited for the consequence of this conjuration. The result was, that he finished the chapter he was reading without being distressed even by a whisper of disturbance.

G. W. Kendall, formerly of the New Orleans *Picayune*, is farming in Texas, and experimenting upon the Chinese sugar cane. He says it will stand a drouth better than any thing he has ever seen.

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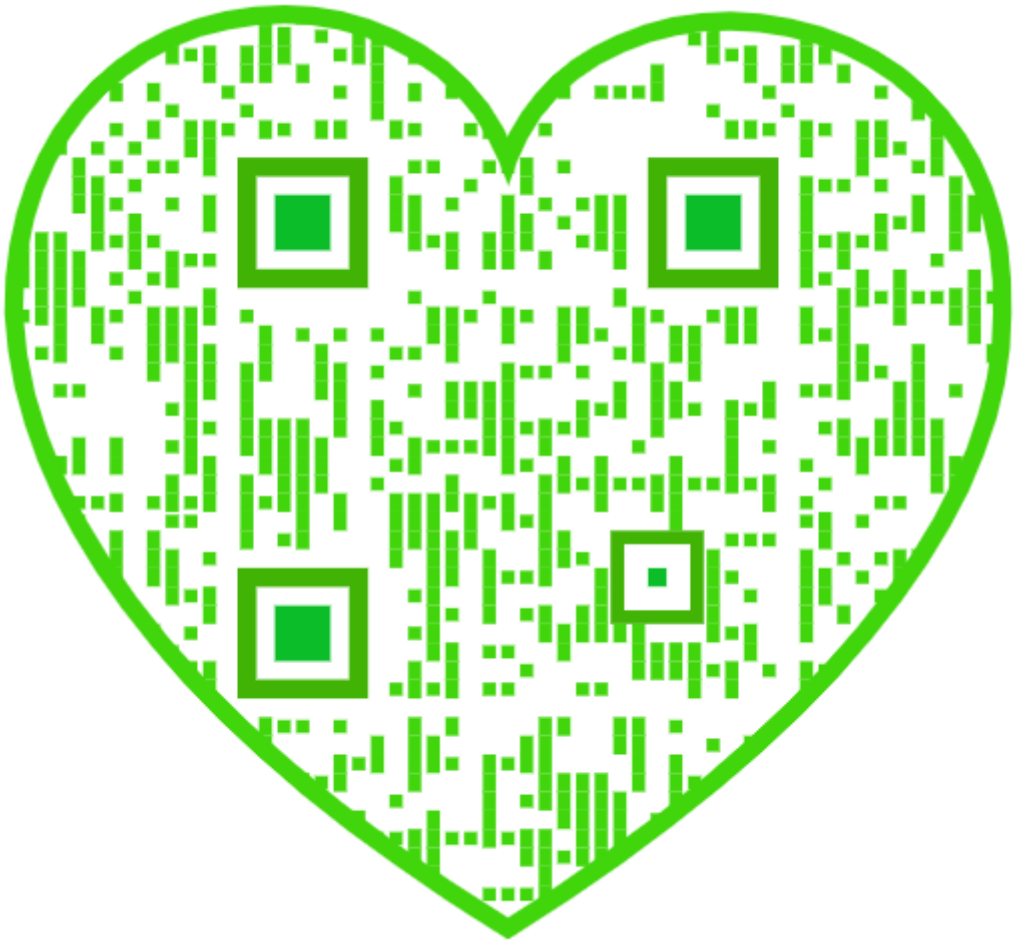

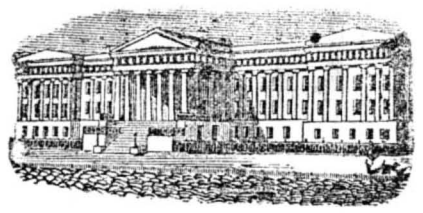

[Reported officially for the Scientific American.]

LIST OF PATENT CLAIMS

Issued from the United States Patent Office

FOR THE WEEK ENDING APRIL 14, 1857.

BORING MACHINE—Jonas Bosenbury, of Cherryville, N. Y.: I claim the arrangement of devices, as described, for the purposes set forth.

COOLER FOR WINE, BEER, AND OTHER LIQUIDS IN BARRELS—John F. Burgin, of Northumberland, Pa.: I do not claim broadly the placing of one refrigerating vessel within another.

But I claim arranging the two cylinders, c d, eccentrically in respect to each other, when the widest portion of chamber B is directly below the opening, a, as set forth.

[This cooler is especially adapted to preserve fluids, such as wine, &c., at the proper temperature. In the inside of an outer case another case of zinc is placed, supported on skids, leaving an air space all around, thus forming a good non-conductor. The ends are enclosed, but the side opens to receive a barrel of wine, or other liquid, into the inner case, which is then filled with ice and water, through an adjustable opening. A pipe and faucet runs off the water when required.]

SCHOOL SLATES—Samuel R. Burrell, of New York City: I claim the application of a permanent or fixed pile, and also a movable pile to the ordinary slate frame of commerce, in form and manner as set forth and described.

CROSSING THE FIBERS OF FELT CLOTH—Thomas B. Butler, of Norwalk, Conn.: I claim the arrangement and use of the regular polygon heads, B B, cams, C C, guide plates, F, and traversing rods, G, connected with and operated by the shaft, A, substantially in the manner and for the purpose specified.

TABLE MANNA—Merano Butterfield, of Indianapolis, Ind.: I claim the use of the sulphate of alumina and potassa, or its equivalent, in the manufacture from white sugar of a substitute for honey.

HOT AIR FURNACES—John H. Cahill, of Philadelphia, Pa.: I do not claim generally making a hot air furnace surrounded with radiating flues combined with a central chamber having a damper, by causing direct and indirect draft through the furnace, as such arrangements are common and well known.

I claim the clean out holes, l, in the lower radiator, C, in combination with the short stopper tubes fitting adjustably within the same, and opening through the lower plate of the said radiator, substantially and for the purposes described.

LEVELS OR INCLINOMETERS—Thomas A Chandler, of Rockford, Ill.: I claim the combination of an entire graduated circle, provided with a pendulum and index, with the two parallel sides of the level stock, whereby I am enabled to apply either side of said stock to the surface whose direction is to be ascertained, and at the same time have the index facing the operator, in whatever position he may be placed.

I do not claim the level stock, with its opposite sides parallel, nor the graduated indicating circle or dial, nor the indicator with two horizontal and one vertical pointer, nor the knife edge bearing, upon which the indicator and pendulum are mounted, nor the pendulum, because separately and for other purposes they are all well known; but they have never before been combined to form a level, nor has a level of any kind ever before been made capable of performing the functions of this combination.

Therefore I claim the level composed of the before enumerated parts in combination, whereby, among other things, either edge of the instrument may be used uppermost, with its face or dial towards the operator, and when any two of the pointers are screened from sight by an intervening body, the third will indicate the inclination of the surface to which the instrument is applied, and the angles at the head and foot of a rafter will be indicated at the same time

LIFTING JACK—John S. Chesnut, of Philadelphia, Pa.: I claim, in combination with the rack lever, C, and the bracket, D, the thumb lever, E, so that the user may, with one and the same hand, work the jack, and throw the bracket in and out of gear with the rack at pleasure, the whole being combined in the manner and for the purpose set forth.

RAKING DEVICES FOR HARVESTERS—Isaac H. Conklin, of Rockford Ill.: I claim operating the hopper, j, attached to the shaft, K, by means of the pin, n, on the plate, m, in combination with the pinions, h h, on the shaft, K, when the said parts are constructed and arranged in relation to the platform, A, in the manner and for the purpose set forth.

[This harvester delivers the cut grain in gavels or sheaves in a gentle manner, not shaking or jarring them (as in some machines) to displace the grain. A curved sickle is employed, and curved bars on the rod; the grain is laid upon the platform in the radius of a circle, and the rake sweeps it into a hopper, which measures the gavel, and when full it is tipped, laying each gavel neatly on the ground—an ingenious invention.]

SAWING SHINGLES—Jonathan Creager, of Cincinnati, O.: I claim the combination of the bench, i, rocking rest, f, and adjustable stops, g g', with circular saw, fed transversely of the shingle by treadle, and cutting longitudinally, when arranged and operating in the manner substantially as and for the purposes described.

LIFTING JACK—Robert W. and Daniel Davis, of Yellow Springs, O.: We do not claim the ratch bar gripe, pawls or connecting rods described.

But we claim the application of the power centrally beneath the self-clutching gripe or collar, whereby its action is directed in the line of the axis of the ratch bar, for the purpose specified.

We also claim the free upright connecting rods, G G, upon which the reciprocating gripe rests, arranged and operating in combination with said gripe and the lever, substantially as specified.

FILTERING LIQUIDS—Benjamin N. De Buffon, of Paris, France. Patented in France May 3, 1856: I claim first, the general arrangement and construction of tritular apparatus for filtering water and other liquids, as described and shown.

Secondly, the mode of constructing stationary and tubular filters, in which the impure water to be clarified is passed from the exterior to the interior of the filter, as described.

Thirdly, the compressing of the filtering material, as described.

TANNING HIDES—D. H. Kennedy, of New Alexandria, Pa.: I claim the combination of valonia, the sulphate of soda, sulphate of magnesia or sulphate of potash, and sulphate of alumina, sal soda, borax, or boracic acid dissolved in water, or tan bark liquor, for the purpose of tanning hides and skins, substantially as set forth.

CHAMBERED BREECH FIRE-ARMS—James Kerr, of London, England: I do not limit my claim of invention to the peculiar form of the cam part of the lever, nor to the manner of catching and holding it against the barrel, as these may be modified within the range of my invention.

I claim fitting the rammer for ramming the charges in the chambers of the rotating breech of fire-arms in a longitudinal groove in the side of the body or frame, substantially as described, in combination with the cam lever fitted to a mortise, in the rammer, for operating it in the manner substantially as described.

INDIA RUBBER HOSE—Thomas B. De Forest, of Birmingham, Conn.: I do not claim generally the combination of a rotating mandrel pressure rollers, and guide rollers, for the purpose of forming India rubber hose

But I claim, first, the employment of a pressure roller or rollers, e e, of a length equal to a comparatively small portion of the length of the mandrel, when such roller or rollers, or the mandrel, have a longitudinal movement, substantially as and for the purpose set forth.

Second, giving the mandrel a rotary motion independently of the pressure rollers, and causing the latter to derive motion from the mandrel, substantially as and for the purpose set forth.

Third, making the pressure rollers of a tapering form, so as to exert less pressure nearest where the laying or winding of the fillet or fillets takes place, and a gradually increasing pressure as the wound fillet advances farther between them, substantially as described, for the purpose set forth.

Fourth, the mode of operating the mandrel and the pressure and guide rollers, whereby the fillets are first wound upon the mandrel to form the hose, and the hose is afterwards pushed longitudinally off the mandrel, substantially as described, viz., by giving rotary motion to the mandrel while the carriage which contains or supports the rollers moves in one direction longitudinally in relation to the mandrel, and suspending the said rotary motion while the rollers move in the opposite direction.

Fifth, the combination of the clamps, a a, flanged collars, b b, pins or screws, x, springs, y y, and elliptic collars, z, applied and operating in the head stock, C', to clamp the hose to the mandrel, and liberate it therefrom, substantially as set forth.

Sixth, the combination of the two spring clutches, P P', and Q Q, the levers, P Q, the spring bolts, p q, the tappets, t u u', and the sliding bar, T, the whole operating together, as described, to cause the roller carriage to be driven in opposite directions alternately.

[This improvement relates to the formation of water hose from strips of India rubber, by winding them spirally on a mandrel, and submitting them to peculiar pressure by rollers, to unite and cement their edges, thus forming the tubing. To form water hose in this manner is not new, but this improvement renders a machine used for such a purpose self-acting, and produces superior and more economic results.]

WASHING MACHINES—Thomas A. Dugdale, of Richmond, Ind.: I claim combining the vibrating frames and rollers, F F F F, the plate, G, the knob, H, and pin, m, with the wash boards, B, and rollers, D, substantially as described.

REEFING SHIPS' SAILS—James Emerson, of Worcester, Mass.: I claim the adjustable clamps, D, when arranged so as to be enlarged or decreased, as required.

Secondly, I claim the screws, E, and claws, X, on the roller, O, for spreading the sail.

REVOLVING FIRE-ARMS—Josiah Ells, of Pittsburg, Penn.: I claim, first, the use of a self-acting spring stop, operating directly by the trigger, in combination with suitable recesses, t t, in the revolving chambered breech, or their equivalents for the purpose of locking the breech at the moment of firing, and leaving it free to rotate at other times, substantially as described.

Second, Making a cam, o, for the bearing of the trigger spring on the trigger back of the center, on which it springs, in order to admit of easy play and short motion of the spring, where a long sweep of the trigger is necessary.

Third, Constructing and arranging the trigger spring in such a manner as to serve the double purpose of a trigger spring and spring stop for locking the bolt, as described.

Fourth, The combination and arrangement of the claw, b, and notch, y, on the hammer, the pawl or catch, w, and cam, o, on the trigger, or other equivalent devices, for the purpose of retaining the hammer in their respective positions when at full cock, and for effecting the rotation of the breech and cocking of the hammer, preparatory to firing, either by lifting the hammer or pulling the trigger, substantially as described.

FORMING THE BRIMS OF FELT HATS—W. A. Fenn, of New Milford, Conn.: I claim the employment or use of the rollers, d e, vibrating bar E, working over the bed m, and the serrated segment M, with plate, S, attached, arranged and operating conjointly as shown for the purpose set forth.

I further claim, in combination with the rollers, d e, segment M, and clamp formed of the lever, E, and bed, m, the adjustable frame, C, which receives the block, O, the frame, C, being fitted within the frame, B, as shown and described.

[This machine is the first produced to effect the object hitherto performed by hand labor, and as the forming of hat rims by hand is more difficult and tedious since machine felted hat bodies came into use, because their fibres are more closely matted together, such a machine was much needed. By the use of a corrugated roller, vibrating clamp bars, and stretching segments, the hat body on the block has its lower portion drawn out, stretched at right angles to the block, and the rim properly formed.]

HOISTING BUCKET FOR COAL, &C.—George Focht, of Reading, Penn.: I claim, first, the knife-edged bar, E, arranged with a link, C, and hook, D, whereby the handle is clasped with the front edge of the bucket as before described, or any arrangement substantially the same.

Second, Pivoting the handle to the sides of the bucket near the bottom, as herein described, and clasping said handle to the front of the bucket, whereby said bucket is completely inverted when said clasp is unlocked from said bucket, and whereby the tendency of any weight in the bucket is to keep said handle clasped with said bucket as set forth.

GAS BURNERS—E. P. Gleason, of Providence R. I. I am aware that a combination of a central conducting pipe, with a capping pipe, has been patented by Brick; I therefore disclaim said device irrespective of a combination with the peculiar self-regulating check.

I claim the peculiar arrangement of the holes, e e, in combination with the connecting tube, I, and the perforations, i, i, i, i, for the purpose specified.

TREATING GUTTA PERCHA—Robert Haering, of New York City: I claim in vulcanizing India rubber and similar gums the use of pipe-clay, or its equivalent, for the object set forth, in combination with sulphur, substantially in the manner and for the purpose described.

EXPANSIVE BIT—Alex. Hall, of New York City: I claim, in combination with a boring tool, an expanding bit or bits, whose turned cutting edge and shank passes through a mortise in the shank of said boring tool, and is secured therein by a pin, as herein set forth, so that said expanding bit or bits may have a cutting edge from the center of the boring tool to its extreme outer edge, as set forth.

FEEDING FUEL TO FURNACES—James Hemington, of Richmond, Ind.: I do not confine myself to the employment of a trunk, H, containing a series of moving blades or scraper, i i, to supply the box, A, as any other suitable means of keeping it properly supplied may be used.

Nor do I confine myself to the use of any particular number of feeders, e e, upon each shaft.

But I claim attaching the feeders, e e, to their shafts by joints, ff, and applying springs, g g, thereto, substantially as and for the purpose set forth.

[This improvement is specially applicable to steam saw mills. It supplies saw dust or other similar light fuel in proper quantities without admitting more cold air than is necessary to furnaces. A box in the mouth of the furnace has two adjustable openings in front and two behind, and no air passes into the furnace but through those of the front. Two revolving wings or shafts in this box feed the saw dust into the furnace, and an endless apron, with scoops, conveys the saw dust from a hopper to the feeding box.]

COATING METALS WITH SILVER—Levi L. Hudson, N. Y.: I do not claim the use of cyanid of silver, for this has been used in the electrotype art, nor the use of the grape sugar or Paris white separately considered.

But I claim the combination of cyanid of silver, grape sugar, essence of sassafras, clay and Paris white, or any of their equivalents respectively, substantially in the manner and for the purpose described.

ATTACHING BUCKETS TO WATER WHEELS—J. R. Howell, of Alexandria, Va.: I claim the method described of adjusting and securing the buckets, A, to the arms, c, of the water wheel, that is to say, the arrangement of the ribs, B, mortises, or their equivalents, and bolts, E, in combination with the flanged end, a, of the arms, c. of the wheel, substantially as set forth

ENGRAVED PLATE PRINTING PRESS—M. C. Gritzner, of Washington, D. C., assignor to M. J. Gritzner, of same place: I claim covering the wiping rollers, or their equivalents, with oilcloth or oiled silk, or any other material impervious to ink, for the purpose of having a wiping surface from which ink can be constantly removed by a scraper or otherwise so as to keep it clean, in contradistinction to cloth, leather or similar materials which absorb ink.

I also claim, in combination with a reciprocating bed plate, carrying an engraved plate, or its equivalent, to be printed from one, two, or more wiping rollers, revolving each upon its own axis, when the said axis has a reciprocating, rotating, or any other motion, in a plane parallel with the plane of the bed plate.

I also claim passing a wiping band over two or more wiping rollers, when said rollers have the compound motion given to them in the manner described.

I also claim producing the proper degree of pressure between the cleaning surface and the plate, by means of a compressed gaseous or liquid fluid.

I also claim the manner specified of securing the plate to be printed from the bed plate.

WARDROBE OR BUREAU BEDSTEADS—J. S. McCurdy, of New York City: I do not claim constructing a bedstead that may be folded up into the form of a bureau, irrespective of the particular means by which that is effected, as several forms of bureau bedsteads have before been made.

But I claim the combination of the leaf, B, and slatted sliding frame, c c, and folding legs, a a, constructed, arranged and operated in the manner and for the purposes set forth.

STEAM BOILERS—Nelson Johnson, of Jasper, N. Y.: I claim, in combination with the employment of a direct internal flue, and a direct passage, f', under the bottom of the boiler, both leading from the fire place to the chimney, I claim the arrangement of the two dampers, G and H, substantially as described, for the purpose of controlling the direction of combustion, and using the boiler as a direct draft cylinder or boiler, or direct flue boiler.

[By this arrangement of dampers in steam boiler furnaces, the products of combustion can be diverted from under the bottom of the boiler through the flues to the chimney, or vice versa, according to the depth of water in the boiler—a very useful arrangement.]

RAKING ATTACHMENT FOR HARVESTERS—D W. and H. A. Laietra, of Eatontown, N. J.: We are aware that reciprocating rakes, provided with teeth, fitted in a slotted platform, have been previously used, and various devices have been employed for operating them. We therefore do not claim a reciprocating rake, irrespective of the means employed for operating it.

But we claim operating or giving a reciprocating motion to the rake, B, by means of the spirally grooved cylinder, C, in combination with the spirally grooved collar, K, constructed and arranged substantially as shown and described.

We further claim rotating the cylinder, c, by means of the self-adjusting wheel, or roller, E, and vibrating shaft, F, when the same are constructed and arranged in the manner and for the purpose substantially as described.

[In this raking attachment, the rake receives its reciprocating motion by a spirally groved cylinder, which is placed underneath the platform. In the groove of the cylinder is inserted a projection which is attached to a bar connected with the rake, and as the cylinder rotates, the groove in it guides the pin or projection connected with the rake to give the latter its proper motions—all in a very simple and effectual manner.]

TO PREVENT INCRUSTATIONS IN BOILERS—Robert McCafferty, of Lancaster, Penn.: I claim the application and use of gum catechu to prevent and remove the incrustations in steam boilers and steam generators, in the mode and quantities described.

MOLASSES CUPS—D. W. Messer, of Boston, Mass.: I do not claim any vessel to contain viscid fluids.

Neither do I claim a cover or diaphragm as described; nor do I claim any method of fastening the spout or channel way to the vessel as by a screw or solder, as all mentioned above was known before.

But I claim the adaptation of a movable surface or lip (to vessels intended to contain molasses or fluids of the same viscidity), said surface so situated in relation or position with the spout or channel way and forming part of the same; that by moving the said surface in the manner set forth, and described in my specifications and drawings, the viscid fluid or molasses which remains on the movable surface or lip, after pouring from the said vessel, is by the practice of my invention returned to a position where by the force of gravity it returns to the vessel, but in ordinary vessels drip from the mouth or lip.

SEWING MACHINES—W. H. Nettleton and Chas. Raymond, of Bristol, Conn.: We do not claim a single or double loop stitch, as that is well known; neither do we claim a needle feed as this has already been used, neither do we claim the slide cam, o, and slot ll in themselves, as these have before been used; and we are well aware that diverging grooves have been used for stretching the cloth widthways in shearing and similar machinery; but we are not aware that the press bar has ever before been grooved in the manner shown, to prevent the needle puckering the cloth, as it is fed along in the manner shown.

What we claim is forming the face of the press bar next the material to be sewed, with diverging grooves to keep the cloth stretched widthways, and prevent puckering under the operation of the needle, substantially as and for the purposes specified.

We also claim the looper (r or v) formed with the notch 13, into which the needle enters to insure the taking of a loop, when said looper is combined with the slide, o, and slot ll, or their equivalents, for giving the necessary sideways motion for the purposes and substantially as specified.

DRYING AND PRESSING PAPER—John North, of Middletown, Conn.: I do not claim passing sheets of paper between heated cylinders or over-heated plates to dry the same, as that has repeatedly been done in the manufacture of paper; but such apparatus as heretofore used would not answer for printed paper, the printed surface of which must not be touched during the process of drying.

But I claim, first, the apparatus for cleaning the pressing cylinders, substantially as set forth.

Second, I claim, in combination with the pressing cylinder as described, the drying apparatus, consisting of heated plates or chests, between which the sheets of printed paper are passed on tapes without touching or dragging thereon as specified.

BOOT AND SHOE HEELS—Stephen Oliver, Jr., of Lynn, Mass.: I claim my manufacture of heels as made by a mould, and in other respects substantially as specified—that is, with a gutta percha body and tenon, a concave upper surface, and a bottoming of leather, or its equivalent.

ICE BREAKING BOATS—Zachariah Oram, of Camden, N. J.: I do not claim to be the inventor of the various parts described.

But I claim the arrangement of a series of pointed plungers operating vertically and in line which each other, whereby I have the advantage of the series for line or continuous splitting off the ice instead of breaking in mass.

RELEASING DOORS OF COTTON PRESSES—G. W. Penniston, of North Vernon, Ind.: I do not claim the duplex toggle joint, nor the mode of operating it described.

But I claim the traversing bar, e, in connection with the arm, i, of the plunger, for the purpose of retracting the key, f, to release the doors when the plunger arrives at the proper point to make the bale being pressed the size required.

FLUTES—John Pfaff, of Philadelphia, Pa.: I do not desire to confine myself to the exact form of bent tube shown, as the same may be modified and ornamented in various ways without altering the desired result.

But I claim the placing of the mouth pieces of flutes at right angles or thereabouts to the stems or bodies of the same for the purpose specified.

WATCHES—G. P. Reed, of Waltham, Mass.: I claim arranging and fastening the barrel, B, with respect to the pillar plate, essentially as described—that is, so that it shall extend through the pillar plate, and be fastened to the dial side of it—in combination with arranging the main gear wheel, G, so that it shall operate as a barrel head or cover to the barrel, and have the retaining power applied to it, substantially as set forth.

LIME KILNS—Wm. Robinson, of Baltimore, Md.: I claim, in connection with the central fire and partition, B, the arrangement of the side or auxiliary fires, G H, for the purpose of more equally introducing the heat into the stack, and promoting more uniform burning, as set forth.

RAILROAD CAR BRAKE—R. L. Smith, of Philadelphia, Pa.: I do not claim the employment of sliding rods for causing a simultaneous braking of the wheels of the cars throughout the whole train, neither do I claim exclusively the use of inclined planes for operating the rubbers.

But I claim the sliding rods, I I and J J, with the bars, H H, having double inclined planes in combination with the rollers, j j, and the rollers, K K, when the latter are hung to the axles, the whole being arranged and constructed substantially in the manner and for the purpose set forth.

PORTEMONNAIES—D. C. Smith, of Tecumseh: I claim the combination of the several parts of the lock and clasp of a portemonnaie, as described for the purposes specified.

CURTAIN FIXTURES—C. H. Wheeler, of Boston, Mass.: I do not claim broadly fastening the curtain to the rod by securing it to a wire that is introduced into a groove into the roll, having a narrow slit for the passage of the curtain; but this I only claim when the sides of the groove are straight and dovetailed, as described, whereby the curtain is securely held to its roll, without other fastenings as set forth.

SHIRT STUDS—Dutee Wilcox, of Providence, R. I.: I claim my improved stud as constructed with the arrangement and application of a slide bolt, E, with respect to the disc, B, and the two arms turning on separate fulcra, and so as to operate therewith, and be operated as described.

I also claim so constructing and arranging the disc, B, of the slider, E, that its periphery shall extend or lap beyond that of the disc, A, in manner, and so as not only to cover the said disc when closed down upon it, but also to enable a person to grasp the said disc, B, between his thumb and finger, without at the same time grasping the disc, A.

I also claim forming the two levers with recesses in their heels so that they may readily lap over and pass by one another without interference, while being turned on their respective fulcra, and the heels be brought close up to the locking slide, to enable it to lock them, as set forth.

MACHINE FOR SPLITTING WOOD—Wm. L. Williams, of New York City: I claim, first, the combination of the feeding chains arranged as set forth, with the stationary conveying floor for effecting the feeding up of the sticks in a firewood splitting machine, substantially as described.

Second, I claim the moveable side clamps operated by a positive motion, governed by the motion of the knives and proportioned to the displacement of the wood by said knives, for the purpose of supporting the sticks laterally, and also of relieving the pressure upon the same, substantially as set forth.

Third, I claim the arrangement of the two separate knives, each extending entirely across the feeding floor, and being set at such angle to each other, and such distance apart as will effect the cross or second cutting upon a block, which is not at that feed receiving the first cut, substantially as described.

THRESHING GRAIN IN THE FIELD—J. C. and T. G. Wilson, of Cedar Hill, Texas: We make no claim to the threshing and cleaning mechanism, nor do we claim endless conveyors, as such; we further disclaim the employment of endless conveyors for receiving cut grain as it falls, such as are shown in certain combined reapers and threshers.

But we claim the arrangement with a traveling thresher, as described, of an endless gatherer and conveyor armed with hooked teeth in rows conforming to the surface passed over, and operated as specified, to lift cut grain from the swath, and deliver it to the threshing mechanism, the relative position of the several parts being as set forth.

ATTACHING HUBS TO AXLES—Lorenzo Winslow, of Rochester, N. Y.: I claim the method described of attaching the boxes of carriages to the axles thereof, by means of a ring, a, and pin, p, operating in combination with the ring, b, and pin or pins, c c, in the manner set forth.

ARTESIAN WELLS—Jesse N. Bolles, (assignor to M. W. Bolles,) of Philadelphia, Pa.: I claim the combination of cylindrical boring rods with cutters and valves so constructed as to discharge the detritus upon the surface of the ground at every stroke of the drill, as described, or any other mode substantially the same, which will produce the same effect.

WINDING MACHINERY FOR MINES—Edmund M. Ivens, (assignor to himself and Lucien H. Allen,) of Tamaqua, Pa.: I am aware that rotating drums have been made to travel laterally by means of a screw around their axes. This therefore I do not claim,

But I claim the arrangement of the traveling drums on concentric axes, when operated in the manner and for the purposes substantially as described.

I also claim rotating the traveling drums by means of the rollers, J, and ribs or guides, L, arranged at or near their inner periphery, or in any equivalent manner, whereby their hubs and axes are used merely as guides, as set forth.

PHOTOGRAPHIC BATH—John H. Morrow, (assignor to himself and Edward Bennett,) of Baltimore, Md: Being well aware that baths for photographic purposes have been made of glass and earthenware, and disclaiming the invention of chemical immersing baths.

I claim the improved form of constructing a compound or double chambered immersing bath, having an immersing chamber, a a a and a, dripping receptacle, b b b, formed with slopes or inclined upper surfaces, b2 b3 b2, as described.

I also claim the suspension forked dipper device or tablet holder, formed with the spur or ridge, i, as shown and described.

I also claim the bracket or rests, e e e e, in combination with the immersing bath, a a a b b b, as set forth.

BOOT TREES—Wm. W. Willmott, (assignor to himself and Henry F. Gardner,) of Boston, Mass.: I am aware that a rod has been used in connection with jointed levers and nuts for forcing the parts of a boot tree asunder; and I am also aware that a right and left-handed screw rod has been applied to a boot tree, to work in combination with rollers, inclined planes, and wedges to force the parts asunder. I do not, therefore, claim such as my invention.

But I claim applying the rollers, n n, to curved transverse springs so that such springs may cause the parts, e f, to give or spring transversely, to correspond with the dimensions of the boot leg, substantially as set forth.

RE-ISSUES.

CARPENTERS' GAGES—Joel Bryant, of Brooklyn, N. Y. Patented Aug. 19, 1856: I no not claim the invention of gages, nor the invention and use of markers or cutters for gages, unless operated as set forth, by a screw.

But I claim the invention and exclusive use of point holder or holders for the points, markers, or cutters of gages, and instruments equivalent thereto, irrespective of any particular or definite form or kind of gage, and irrespective of any definite form or kind of holder, means or contrivance, having a screw thread cut within the same, and corresponding with a screw thread cut upon the said points, markers, or cutters, so as that the said points, markers, or cutters are operated within the said holders, to be raised or lowered through the instrumentality of the said screw threads within the said holders, and upon the said points, markers, or cutters of the said gages, or instruments equivalent thereto, as set forth.

REAPING MACHINES—Obed Hussey, of Baltimore, Md. Patented Aug 7, 1847: I claim the improved beveling of the edges of the blades of scalloped sickles, as described.

REAPING MACHINES—Obed Hussey, of Baltimore, Md. Patented Aug. 7, 1847: I claim the combination of a vibrating scalloped cutter, the indentations of whose edge act as a series of a moving shear blades, with slotted guard fingers, the sides of which act as a corresponding series of fixed shear blades, the parts of such fingers forming the slot, being connected at the front ends only, leav-

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ing the rear of the slot open and free for the escape o material that would otherwise clog the cutter, substan tially as described.

REAPING MACHINES—Obed Hussey, of Baltimore, Md. Patented Aug. 7, 1847: I claim the combination of a slot formed between the long and short parts of the guard finger, with an opening in the rear of the short part, substantially as described.

SEWING MACHINES—Joseph P. Martin, of Philadelphia, Pa., (assignor of John A. Bradshaw, of Lowell, Mass.) Patented Nov. 23, 1848: I claim regulating the tension of the thread, after it has been unwound from the bobbin by means of apertures and bars, with, upon or through the thread case, either separate or combined, or by any equivalent means, when said means are within, upon, or form part of the bobbin case itself, for the purpose specified.

Springs or screw bearings upon the bobbin, separately considered, are not claimed.

I claim, secondly, regulating the tension of the shuttle thread in the act of leaving the bobbin, by a combination of one or more screws with a spring, or any yielding or elastic substances, or any equivalent devices for producing the same effect.

SEWING MACHINES—Joseph P. Martin, of Philadelphia, Pa., (assignee of John A. Bradshaw, of Lowell, Mass.) Patented Nov. 23, 1848: I claim the covered shuttle to be used as a sewing machine, or in other words, constructing that portion of the bobbin case which comes in contact with the top, cylindrical, or in any other form which does not present edges in its transverse section.

DESIGNS.

STOVE PLATES—A. C. Barstow, of Providence, R. I.

CLOCK CASES—Elias Ingraham, of Bristol, Conn.

CLOCK CASE FRONTS—Chauncey Jerome, of New Haven, Conn.

[We admire the improvement in taste which is now manifesting itself more generally in our country, viz., to combine beauty of form with usefulness in the article—whether it be a machine, stove plate, or clock case, &c. Now designs call forth high inventive powers, and their authors should take care to protect themselves by patents, to derive such advantages from them as cannot otherwise be obtained. The design of Mr. Jerome for clock case fronts exhibits a cultivated taste in its author.]

COOKING STOVE PLATES—N. S. Vedder, (assignor to Smith & Sheldon,) of Troy, N. Y.

ADDITIONAL IMPROVEMENTS.

FILTER—David N. B. Coffin, Jr., of Newton Center, Mass. Patented Sept. 2, 1856: I claim, first, so constructing that part of filter to which the filtering medium is attached, and providing it with a seat in the case, that it may be raised from said seat or turned upon it, so that the water shall be free to pass in from the faucet, through and around the filtering diaghragm, in such manner as to wash away the impurities from the surface of the diaphragm, substantially; also to relieve the force of the stream of water when drawn without filtering

Second, I also claim in combination with the ring, i, the flange, u, for holding in their place the additional layers, as set forth.

Third, I claim the grooves on the outer surface of J, in combination with the ring, whether separate or continuous, like the thread of a screw, with or without a corresponding inside screw formed in the ring, for greater certainty in holding the diaphragm, also the rebate shown, so that the ring may reach a little below the largest part of J, at f and h, for the same purposes.

SAFETY HATCHES FOR WAREHOUSES—William H. Thompson and Eustis P. Morgan, of Biddeford, Me. Patented June 24, 1856: We claim the opening and closing of vertical doors attached to the tube or box of an elevator by means of the action of a traversing car or platform and its attachments, as set forth.

[NOTE—The residence of A. P. Wilson, whose patent claim for improved windmill appears on page 219 of the present Vol. should have been Solon, instead of Salem, Ill.]

Manufacture of Car Axles and Iron Castings.

MESSRS. EDITORS—In the SCIENTIFIC AMERICAN, No. 20, this volume, there is an extract from the *American Mining Magazine*, under the head of "Crystalization of Wrought Iron." In regard to the manufacture of railroad car axles, I am of the opinion that much may be done to improve their strength and durability. The object of our people, apparently, is to manufacture everything cheap, railroad axles forming no exception. This is bad and expensive policy. No one kind of iron ore should ever be used alone in the manufacture of wrought or cast iron.

The experience that I have had for some years in the use of metals from the pigs is this:—I find in all cases that it greatly improves the castings to mix different qualities of iron. I have tried the best brands of the Scotch pig alone, also a large number of American brands, to obtain strong, soft and tough castings—some anthracite and charcoal brands, hot and cold blast, made from magnetic hematite and silicious beds of ores—and in every instance failed to accomplish my object; but when I mixed or crossed the brands I succeeded. I do not believe in the mode which is now in practice in the manufacture of solid car axles. It is generally supposed that old wrought scrap iron is the best for this purpose. The question may be asked why is this? The fibre of this iron is cut too short, and oftentimes pieces of the poorest kinds of iron find their way into the bloom from which an axle is to be made; and these same pieces are laid into the bloom or package of metal crossways, and in this manner the workman attempts to weld or consolidate them for an axle. If the fibre of the iron is thus cut and laid, how can it be possible that this method should make a perfect axle?

I will now state what course should be taken to make the best solid axle, not that I think, however, that kind of an axle the best. First, the stock should be selected from a mixture of ores, which have been smelted together. Then the pigs when puddled should be well refined and rolled into bars, not too large but of sufficient length for an axle, without being cut between ends. In this manner the fibres will all be laid one way by the rolling process, and that lengthwise. Enough of these should be taken and well welded—say ten or twelve bars to form the axle. By this method a good refined solid axle can be produced without flaws or cracks. I am of the opinion that charcoal pig iron is the best, and should be used exclusively for such purposes. The smallest amount of crystalization in the center of a bar of iron virtually destroys its utility. I also find it so in the manufacture of malleable iron castings, and crystalization in them will cause them to brake like pipe stems, even after they have come from the annealing furnace.

Too hard pig iron is often used in castings. I have seen it so hard that it was impossible to molify it for castings in a furnace made for the purpose. I have taken castings of such metal, melted them over, and tried to run the metal into large moulds, but it would separate from other iron melted with it while in the cupola, and I found it difficult to get it out. The subject of crystalization was noticed in the SCIENTIFIC AMERICAN some months since, in regard to brittle malleable iron castings. It is clear to my mind that their stock was too high or hard, and this was the cause of their brittleness. B. B.

Westmoreland, N. Y., April, 1857.

[The brittle casting of malleabilized iron to which our correspondent refers was *cold short*. The opinions of our correspondent accords with the experience of skillful iron and steel manufacturers. The importance of sound and tough axles for passenger cars and locomotives cannot be overrated. The breaking of axles has caused some of the most serious and fatal accidents on record. The late very fatal occurrence on the Great Western Railway was in all probability, as shown in another column, due to this cause. Scrap iron is decidedly inferior to good native iron. Ames' very extensive works in Connecticut, devoted to the manufacture of locomotive tires and car axles, uses no metal but that direct from the Salisbury ore beds, smelted by charcoal fuel with a cold blast, and subsequently many times drawn out under the heaviest hammers and repiled. Such processes with our best American ores produce work far superior in strength and toughness to the best foreign brands, and absolutely free from the flaws and weak spots incident to the scrap iron blooms. The manufacture of such important forgings as car axles from the very finest iron, in the best known manner, is a point that should merit far more attention than it does; and we mention these works, and the processes therein, as the best with which we are personally familiar, but presume there are others in our country which conduct the work in the same way, and with the like superior results.

Inks and the Manufacture of Paper.

MESSRS. EDITORS.—I notice a communication in the SCIENTIFIC AMERICAN, April 11, upon "Inks," signed H. A. S., which contains a clear explanation of the inferior value of modern paper, for the preservation of either written or printed documents. Nearly all white papers now produced are bleached with chlorine in some form; and since paper stock has risen in price, poorer qualities are used, which require more chlorine and acids, and these latter are removed only with increased washing—and, in fact, mere washing cannot wholly remove them. These substances remaining in the paper discolor it, soften it, and make it furzy so as to clog the type, and act on the ink to make it fade. While it is impossible to remove it by washing, it may be promptly and perfectly neutralized by chemical agents known as anti-chlorines. The use of these articles is universal in Germany and France, as well as England, and they are now used in this country by many of the best manufacturers of both book and writing papers, among whom are Platner & Smith, May & Rogers, and Whyte & Hulbert, of Lee; Brown, of Adams; Carew, of Hadley; Imlay & Weston, of Hartford; Platner & Porter, of Unionsville, and many others. These anti-chlorines are comparatively inexpensive. They render excessive washing, and the loss of pulp, time and power that attend it unnecessary; they preserve the wires, blankets, and other parts of the machinery from destruction, and effectually prevent any change in the color or firmness of the paper or permanency of the ink. The cheapest and best dechlorinating agents are anti-chlorine and anti-chloride of lime, manufactured in Providence, R. I.

H. E.

Iron Water Tanks.

MESSRS. EDITORS—A correspondent of the SCIENTIFIC AMERICAN (J. E. B.) is in the same difficulty that I was some months ago, being in want of a tank to hold water fit for drinking, bathing and culinary purposes. I wanted also to have mine strong enough to bear Croton pressure, so as to carry a waste pipe up to the top of the chimney, and form a lightning conductor. I had one made of iron, No. 16 gage, galvanized, and riveted together with copper rivets. The diameter is about 29 inches by 6 feet high. It holds 215 gallons, and cost $75. The heads are of boiler plate, 1-4 inch thick, and consequently strong enough to lap for connections legs, &c., to stand upon, so as to be entirely independent, and require no wood work around it. I shall be happy to show the tank to him on calling at my house. T. PROSSER,

No. 28 Platt street.

New York, April 10, 1857.

Notes on Science and Foreign Inventions.

Preserving Timber.—R. W. Sievier, of Brussels, Belgium, has patented a process for treating wood to preserve it, which, apparently, embraces some excellent features. The timber is first saturated with certain solutions, then compressed between rollers, so as to close up the interstitial spaces, to render it impervious to air and water, the attacks of insects, and destructive influences of the weather.

The wood to undergo this process is first dried in any manner, to expel moisture and air, then it is plunged into a bath of pitch, rosin, or asphalt, dissolved in turpentine. This part of the process is best accomplished in an air tight iron tank, connected with an air pump for exhausting all the air.

If the timber is designed for ship's planking, and to resist the attacks of the *toredo navalis* (ship worm) or other insects, it should be first impregnated with a solution of corrosive sublimate, and then dried before its pores are filled with the bitumen.

When the timber is saturated with the resin solution, it is taken out of the tank and allowed to stand on a frame for some hours to drain itself of all the superfluous fluid. After this it is subjected to the action of powerful pressure between rollers, the surfaces of which may be so formed as to give the shape or form desired to the timber. The pressure squeezes the cells of the wood close together, and owing to these being filled with the resin gum, they become impervious to air and moisture. The pressure on the wood must be commenced very slow and with a small force, otherwise if it be commenced quick and with great force, the fiber will be injured. It is stated that American pine may be compressed into half its original bulk, by slow and careful pressure, and all the strength of its fibers retained. The solution for impregnating the wood may be colored to imitate mahogany, rosewood, and black walnut; and coarse woods thus made to receive as close a grain, and as hard and beautiful surfaces as the most expensive and dearest woods employed for cabinet work.

The same kind of rollers as those employed for rolling iron are the best for carrying out this invention. The wood should be passed several times through them, each time increasing the pressure. It is preferable to compress it after it is sawn into the form of plank, or veneers; but the invention is applicable to timber of every size and form for which pressure machinery can be constructed.

New Fertilizer.—A patent has been taken out by G. Wariner, of Withernsea, Eng., for the use of ground charcoal mixed with glycerine, to be placed among barn-yard liquids for the purpose of absorbing all the ammonia, and thus saving that most valuable fertilizing agent. The compound is stated to be superior to all others yet tried for this purpose. Glycerine cannot be profitably employed by farmers in our country for this purpose, excepting in the neighborhood of soap factories.

Printing Colored Designs on Glass.—Newton's *London Journal* for last month contains an abstract of a novel and ingenious process for printing colors on glass, for which a patent has been secured by Henry Page, of London. The surface of calico, paper, or other suitable material, is coated with size, gum, or starch, and when dry the design is printed on it with colors made up in varnish or oil. The size prevents the printed colors from entering the surface on which the design is printed, and when the whole is dry, may be kept rolled up until wanted to be fixed on the glass.—The glass is now prepared by taking off its polished surface with emery, or other suitable material, and made quite rough. It is then ready to receive a coat of hard white varnish, japan, copal, or other suitable body varnish, and when that is done, and before it dries, the surface of the printed design is turned down upon it, and pressed down evenly. When quite flat the back is wetted with water, which softens the size, and allows the fabric on which the design was printed to come away, leaving only the printed design on the glass. The whole is dried off together, and then washed well in water, to remove any size that may have passed in the transfer. The design or ornament now only requires hardening, and this is effected by placing the glass in a drying stove, oven, or other suitable apparatus. Care must be taken that the heat is applied slowly, and not carried high. The heat must never be carried beyond the degree the nature of the colors will allow without injury.

A New Anesthetic Agent.—The vapor of amylene has been used, it is said, with good effect by Dr. Snow, in King's Hospital, London, as a substitute for chloroform. In the case of a severe operation on the face of a man, although there was some amount of consciousness, complete insensibility to pain was manifest; and when the operation was concluded, which moreover occupied some time, the faculties were very quickly indeed restored, and the man walked to the wards without support, instead of being carried, as after chloroform. In seventeen instances in which Dr. Snow has given the amylene, in not a single case was there any sickness or vomiting, which is a decided advantage over the chloroform, although it requires a much larger amount to be used to produce its desired effects. Dr. Snow believes a substance will yet be found that will produce anesthesia without loss of consciousness.

Straw Paper.—A great deal of paper is now made from straw, but it is coarse and hard—too brittle—and unfit for the purposes of printing upon. Improvements, no doubt, have been made in the manufacture of straw paper within a few years; it has been bleached perfectly white, and made of a tolerable smooth surface, still the best of it is harsh and hard, in comparison with rag-made paper.

An improvement has recently been made in Belgium by M. Helin, by which, it is said, paper of a soft, yet firm and excellent texture, far superior to any hitherto made, can be manufactured from straw.

The common plan of preparing straw for pulp has been to boil it first in alkaline solutions. The new process of M. Helin consists in employing a prior process to ferment the straw, something like that for retting flax. The straw is first steeped entire for sixty hours, or more, in water of 55° to 85°, varying according to the season of the year.—After some hours the water becomes gradually warm and discolored, and an active fermentation takes place; after sixty hours the liquid is suffered to run off, and the straw must be washed with a plentiful supply of water, in order to remove therefrom all the soluble coloring matter. The straw is then drained, and while still damp is subjected to the action of millstones, rolling on a plain surface, or passed between a pair of rollers, in order to flatten it. It is then forced between other rollers furnished with cutters, or other suitable apparatus, whereby the straw may be formed into filaments or fibers, as long and continuous as possible. After this it is dried in the sun, then steeped or boiled in an alkaline solution preparatory to being reduced to pulp, and bleached by any of the methods in common use.

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New Inventions.

Leather and Moleskin.

A few months since we directed attention to this subject, stating that some useful substitute for leather would be a most valuable invention to the community owing to its scarcity and increasing price. We notice in a late European exchange that prepared moleskin (thick cotton twill, with a nap) has been substituted to a large extent in France for calf-skin leather in the upper of shoes, and this has arrested a further advance in the price of upper leather in that country. In our own markets, the price of leather has till now kept steadily increasing. The principal cause of this, we are told, has been a drain upon hides from our markets to those of France, Germany and England. At present, the tide appears to begin to ebb as regards the price of sole leather, but not of fine calfskins employed for the uppers of boots, nor is it expected that the price will fall, as the demand for it is greater than the supply. We regret this, for the finer kinds of it have almost ceased to be employed in the manufacture of ladies' and children's gaiters, buskins, &c. Sheep-skin leather, half tanned, thin as wrapping paper and almost as tender, has been used as a substitute for it, while coarse paper of a most wretched description is employed for inner soles.

The uppers of *foot clothing* made of such material cannot withstand the action of water; rain penetrates them nearly as freely as through blotting paper, and to use a common but appropriate term, "they have no wear in them." Some substitute for such material would be of great importance, for the cheap shoes of children and youth, especially girls.

The employment of strong moleskin for this purpose, as has been done in France, would be an improvement, and we therefore suggest its use; it is cheap, light, and would prove more durable, we believe, than sheepskin leather.

Excavating and Ditching Machine.

In the accompanying illustrations, figure 1 is a perspective and figure 2 a transverse vertical section of a machine for excavating earth, cutting ditches, &c., and casting the earth to the one side, for which a patent was issued to William Provines, of Columbia, Boone County, Missouri, on the 13th of January last.

As this machine is drawn along, a series of cutters and scoops, revolving crosswise to the direction of its motion, excavate the soil, cutting a trench, and casting the lifted earth to the side.

A represents the frame of the machine, which is supported at the rear end on a pair of wheels, B C, the one (B) is fast on the axle to act as a driving and supporting wheel, the other (C) may be loose to facilitate the turning of the machine. The front part of the frame is supported by braces, D D, to the truck, E, to which the horses are attached. These braces serve as *hounds* to direct the machine. On the axle of wheels B C, is a bevel wheel, F, which gears into and moves another one, G, on a longitudinal shaft, H. On the forward end of this shaft is a wheel, I, which gears into a pinion, J, on another shaft, K, which is the axle of the digging or excavating wheel, L. The axle of this wheel is parallel with the line of the machine's motion. It will therefore be readily understood, that as the machine is drawn along, the digging wheel, L, on shaft K, will revolve in a line at right angles to the line of motion.

Upon the hub of wheel L there are arranged a series of radial arms, M, to which are connected by means of forked brackets, N, a series of scoops, O. (These are shown clearly in the enlarged view, fig. 2.) Each alternate arm preceding a scoop has sharp curved cutting blades, *a a*. The scoops follow close after these cutters, catching and lifting the earth loosened by them. The scoops are pivoted at *c* to the arms of the brackets, also at *e* to the ends of arms, *b*; the other ends of which are attached to springs, *d*.

The lever, P, pivoted at *f*, to the frame, has a friction roller, Q, upon its inner or lower end; this roller strikes the springs, *d*, when they come round, as the scoops rotate and compresses them, changing the position of the scoops to make them carry further or cast their contents quicker.

The lever, P, is readily adjusted and within the reach of the attendant, who can regulate it at pleasure to compress the springs, *d*, more or less, thus causing the scoops to carry the earth higher up if desired, before it is cast from them by the momentum of the revolving wheel.

If it is desirable to cast the earth thus excavated into an embankment, the arms, *b*, may be disconnected from springs, *d*, and attached direct to the hub, L, at the points, *i i*. The lever, P, may then be shifted, to throw its roller, Q, (which acts as a trigger) out of action, and the scoops so arranged will cast their contents by the centrifugal action of the excavating wheel in a regular line, as the machine is drawn along. When the lifted earth is to be scattered at the side promiscuously, the scoops have different inclinations to discharge at different points of their circuit.

The shaft, K, is secured in standards, R, (one seen) which are pivoted at *g*, to the frame. S S are levers attached to standards, R, and are united at their tops by a cross bar, T. On the frame, A, are triangular pillar blocks, U U, in which is mounted a windlass, V, having a crank lever handle, *h*.

The chain or cord, *m*, passes from the windlass to the cross bar, T, of the levers; the other cord, *n*, passes through loop, *k*, to the windlass. By turning the windlass in one direction, the digging wheel with its scoops can be raised up and out of gear with the wheel, I, while the machine is being transported from place to place; by turning the windlass in the opposite direction the excavating wheel is lowered and brought into action. The strain on the chain, *n*, through the levers, S, holds the pinion, J, and wheel I, in gear, while the machine is operating.

The cutting of the earth to prepare it for the scoops as described, is a correct and good principle of action, enabling the machine to operate with great ease in a stiff soil, or where there are tough vegetable fibres and roots to be cut through in swampy or meadow land. This machine seems to be an invention much required to ditch and thus reclaim vast tracks of wet and swampy lands, the ditching of which by manual labor is out of the question, on account of its great expense.

More information may be obtained by addressing Mr. Provines, at Columbia, Mo.

EXCAVATING AND DITCHING MACHINE.

Fig. 1

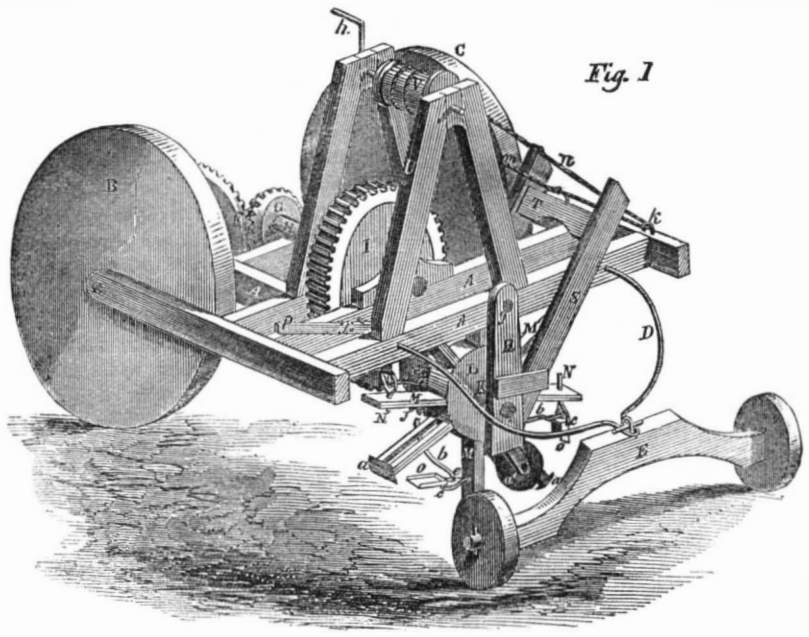
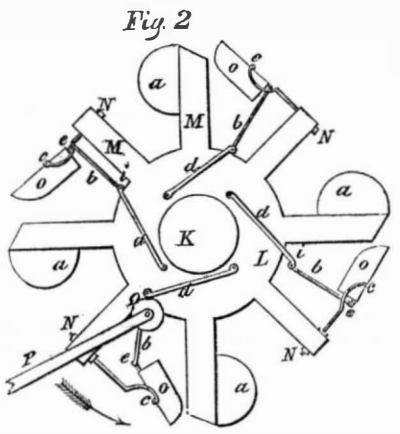


Fig. 2



NICHOLS' CHANGEABLE PLANE.

Fig. 1

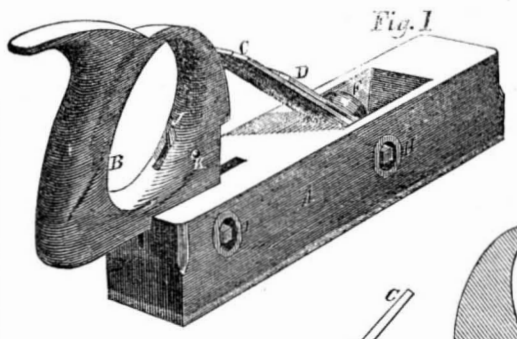


Fig. 3

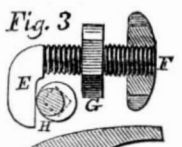
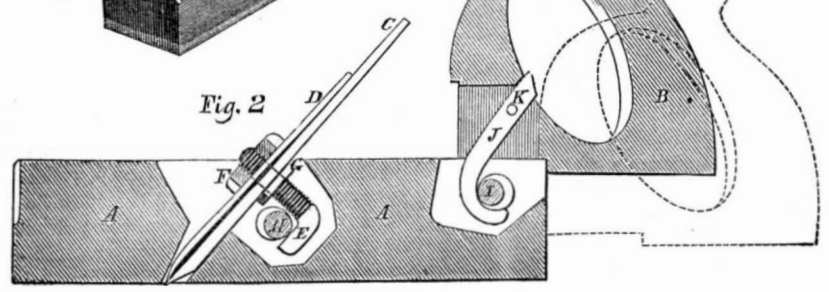


Fig. 2



Mr. O. Nichols, of Lowell, Mass., is the inventor of the ingenious means here represented for connecting and disconnecting the iron and the stock, and also for so attaching the handle, that it may be readily and firmly adjusted in two positions. The invention was patented March 10, 1857. The securing of plane irons by wedges as usually conducted, is open to several objections, not the least of which are the tendency of the wedge to spring the stock out of truth, and the difficulty of driving the iron down, or again of elevating it without altering the tightness of its hold. This change in the position of the handle allows the tool to be used with the best effect in every situation. In planing floors and many other surfaces, it is of considerable consequence to have the handle high, as represented, but for ordinary bench work the force of the hand is applied to much better advantage by disconnecting the handle and attaching it again in its lower position, that shown by the dotted lines in figure 2.

Figure 1 is a perspective view of the plane complete; figure 2 is a section through the same, and figure 3 represents the hook-headed bolt used to confine the iron. A is the stock, B the handle, K a pin on the latter to which is connected the hooked link, J, taking hold on the cam shaft, I. Turning I, by means of a wrench applied at the side, the eccentric portion tightens or releases the hook as desired.

C is the plane iron, and D the cap, secured together by the nuts, G and F, on the hook-bolt, E, the hook of which latter is confined or released by turning H. The hook of E, is made quite strong and rigid, and the face in contact with the cam shaft is perfectly parallel to C, so that the iron may be started up or down without affecting the tightness of the grasp on the stock.

The whole appears very simple and convenient. It possesses very obvious advantages; and only requiring a very simple wrench to manipulate it, with hardly a chance of getting out of order, it cannot be said to be objectionable on account of its complexity. For further information address the inventor, as above.

Using Machines under an Extended Patent

A correspondent (P. Gilbert, of Alexandria, Ohio,) makes the following inquiry:—"If a machine is bought with the right to use under the original patent, can the inventor, if his patent is extended, prohibit the using of said machine under the extension?"

As other persons besides Mr. Gilbert may be interested in such a question, we answer it thus, instead of by a short personal answer through our correspondents column.

A right to use a machine sold before the original patent has expired, is continued under the extension, until the machine is worn out or destroyed. A decision has been made on this point by the United States Supreme Court in the case of Wilson *vs.* Rousseau. That decision is based upon the clause in Section 18, Patent Act, 1836, which says:—"And the benefit of such renewal shall extend to assignees and grantees of the right to use *the thing* patented to the extent of their several interests therein." This decision is full and unequivocal respecting the right of an assignee to the continued use of *a machine* of which he was in possession and use at the time of the renewal of the patent.

Justice Woodbury made a similar decision in the case of Woodworth *vs.* Curtis, as recorded on page 607 of Robb's Patent Cases.

This right, it will be understood, only refers to the *use* of machines actually in existence, and bought with the exclusive right of use prior—it makes no matter how short the period was—to the extension of the patent. The rights of simple assignees and licencees of patent rights under the original term of the patent, cease with the extension; such rights are abstract, and entirely different from that of property in a purchased machine. An assignment or license ended with the extension of a patent does not take away the use of any tangible property; whereas the prohibition to use a patented machine under an extension would be an act of high injustice, destructive to the established rights of personal property. For example: suppose an inventor were to obtain a patent on a plow, and under it sold a hundred thousand of such implements, and then obtained an extension of his patent. If the power of prohibition to the use of these plows were conferred upon him by the extension, he could stop the use of them all, and thus destroy the personal rights of a hundred thousand men to the extent of the value of the plows, which they had fairly purchased from him previously, and had thus become their tangible property.

The Magnetic Telegraph Company between this city and Washington, D. C., have just laid down two English triple-wire submarine cables across the Susquehanna, opposite Havre de Grace, for the purpose of securing a permanent and uninterrupted connection of the wires at that point.

Lightning conductors are about to be fitted to all the vessels in the French Navy.

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Scientific American.

NEW YORK, APRIL 25, 1857.

Ivory—A Substitute Wanted.

Ivory is formed of the large upper teeth of the elephant. Those of the greatest size are obtained from Africa; but the tusks of the Ceylon elephant produce ivory which is not so liable to become yellow, hence they are generally preferred. Africa, however, is the great source of the ivory trade; and marvellous are the quantities of this material which have been obtained from that quarter of the globe. Until within a few years, France imported about 200,000 pounds annually, England 12,000,000 pounds, and our own country about 200,000 pounds. The most of the ivory imported into the United States comes from the port of Zanzibar, in Africa, and the trade is almost monopolized by the good people of Salem, Mass, in which place, only two weeks since, a cargo of it arrived valued at $90,000. Ivory is of the same composition as bone, but yet it is very dissimilar from bone; and although other animals than the elephant have large tusks, still none of them produce the genuine article. The teeth of the *sea unicorn* and *morse*, and the hippopotamus are also used for the same purposes as the tusks of the elephant, but they are not so valuable, although some of them are very hard, and sustain a fine polish. Some elephants' tusks have been obtained which measured ten feet in length, and weighed 300 pounds, but the average weight of them is about 100 pounds. Its price varies from 75 cents to $2 per pound, according to its quality. The demand for ivory has been increasing, hence its price has been advancing, with the extension of the decorative arts, such as fine cabinet work, pianofortes, &c., but the supply of it has not been augmented in proportion. This, we are told, is the reason why it now appears to be so scarce in the market—not that the quantity imported annually has decreased.

Fears have been entertained that elephants were disappearing as rapidly in Africa as the buffalo in our own country; but Dr. Livingston, in his recent wonderful travels, relates that the immense herds of elephants which he saw filled him with astonishment, and it therefore seems that these animals are still very plentiful. The difficulty, however, of obtaining a sufficient supply of ivory at present, and the great increase in its price within a few years, suggests the propriety and possibility of manufacturing a cheap substitute. Many attempts, we know, have been made to manufacture an article in place of it from white porcelain, but all such efforts have hitherto proved abortive. It is easy to make hard white porcelain articles of similar forms to those made commonly from ivory, but this is not all that is wanted. Ivory is fibrous and elastic, and can be sawn and cut into any form to fit for the most exquisite inlaid, carved or veneered cabinet work. It is not so with articles of porcelain. But is there no other substance from which we may hope to see a good substitute for ivory manufactured? India rubber compounds are now made to imitate black horn and ebony; can they not be made to resemble ivory? We have never seen any India rubber compound of a pure white color; but we believe it may be bleached and made snowy white, and then compounded with some equally suitable white material to harden it. Ivory has to be bleached itself, by exposure to the sun and frequent sprinklings with water, in the same manner that linen is bleached on the green fields. And why may not India rubber or gutta percha be bleached equally as well by some other process, and then compounded to produce a white material that can be worked by tools, like that from which India rubber combs are made?

Various articles are now manufactured from ivory nuts, a peculiar vegetable production of South Africa; but although hard and white, they are very brittle, and soon become yellow in color. Needle boxes, infants' rings, and various other small fancy articles are now made of these nuts, but they are neither ivory in their nature or quality, and are no substitute for it. That substitute has yet to be discovered.

Car Wheels.

For some of the uses to which cast iron is subjected, great strength is the only requisite; for others, hardness is a quality of great importance; and for others again, as in some of the minor parts of light machinery, the opposite, and a consequent facility for perfect finishing is paramount. There is probably no example in which a combination of great strength at all temperatures—elasticity to resist the effect of continued concussion, and extreme hardness and ability to resist wear in certain parts—is required to so great a degree as in the wheels of ordinary railroad cars. Economy of power impels us to the employment of wheels of large size, so that the number of revolutions, and the consequent friction on the axis in traveling a given distance may be as little as possible; but every increase of size involves not only an increased weight of useless load to be moved with each car, but a necessity for greater strength in all the parts of the wheel itself, and also exposes the track to a greater percussive strain, as the wheel rolls over it. Under these conflicting influences, wheels are manufactured of every size, from twenty-four inches diameter to thirty-six, the smallest being employed in the trucks of some locomotives, and the largest under passenger cars, for rapid traveling, but in every case great efforts are made to combine strength with lightness.

The hubs and rims differ little in all the most approved varieties, but in the form and arrangement of the intervening parts, an almost infinite variation in form is allowable. Scores of patents have been granted in this country for car wheels, and principally for varieties in this part alone. The policy of the Patent Office has been to protect every new form, without inquiring very closely into principles or effects, the subject being one difficult of close and positive analysis in this respect. This course has been very properly adopted as one which would give a fair chance to all, and be likely, in the end, to develop the best possible disposition of the material. Straight spokes, as in the common coach or wagon wheel, have been long since abandoned, as, whatever may be the theories adopted in explanation, the *fact* is sufficiently evident that, with a given weight of metal, they are more liable to break.

Plates, in some form, have come to be considered as a necessity; and it has been attempted, in most of the patents, to so dispose the metal as to allow proper shrinkage and expansion, and provide an ample degree of elasticity, and yet secure just the proper amount of strength, proportional to its strain, at every point diminishing from the center to the circumference.

On some of the New Jersey roads, and to a considerable extent in Great Britain, wood has been employed with very good effect as a filling up between the hub and rim, both of which latter parts are necessarily of metal. Red cedar is the favorite for this purpose in our country, and is applied in blocks properly tapered and thoroughly seasoned, put together and secured by rings, so bolted as to make the whole perfectly solid. These wheels, are light, something lighter, probably, than the majority of plate wheels of the same size, and are considered, in some points, more desirable; but the cost has forbidden their very extensive introduction.

In some foreign countries wrought wheels have been tried, and elaborate and powerful machinery has been devised for properly forging such wheels in one piece; but with us, cast iron alone has been, and will probably continue to be, the popular material. The face, or tread, which rolls on the rail, requires to be of the hardest and most uniform texture, to resist wear. In wrought wheels this may be of steel; but cast wheels are hardened nearly as intensely, though not so tenaciously and uniformly, by the familiar process of "chilling," or rapid cooling, by contact with a good conductor of caloric. This is readily accomplished with proper iron.

We were not aware, until a few days since, of the existence of the "Union Car Wheel and Tire Works," at Jersey City; but while waiting for the cars recently, we spent an hour there very profitably, and will briefly describe the process of wheel-making:—

The work resembles that of an ordinary foundry, except in the provision for chilling and annealing. The tread or exterior of the rim is cast in contact with a heavy ring of iron, previously turned smooth. The metal employed in these works is hot blast iron, from Connecticut. Nos. 3 and 4 are preferred, and small quantities of white iron are added whenever the metal proves not sufficiently inclined to chill. The depth to which the hardening is effected on the rim should be about half an inch, and this may be very readily ascertained if the casting be broken across at that part. In order to afford means for thus ascertaining the depth of the hardened metal, small projections termed "trials" are cast on the side, which trials are broken off by a hammer after the wheel is cold, and readily show by the color and highly crystaline appearance of the fracture, the precise depth of the chill. The mold—constructed in the ordinary manner, except for the insertion of the chill—is broken up as soon as practicable after the metal has been poured. Eight minutes was the time allowed in the instance which we timed; and the wheels, still bright red-hot, are at once transferred to "annealing pots," where they are covered deeply with dry sand, and allowed to remain three days gradually cooling. From experiments made in the Crane Foundry in England, in 1849, it appears that iron chilled and subsequently annealed is considerably stronger than common castings; but it is not probable that the annealing employed in the car wheel manufacture has any such effect, as it is not sufficient to soften the tread, but only to equalize the shrinkage of the metal in cooling, and avoid a tendency to fracture. It would probably be necessary, in order to produce extra strong castings by such means, to allow the chilled metal to cool, and subsequently to heat it nearly to the melting point before placing it in the annealing pots.

The interior cavities, of course, are produced by coring, the cores being sustained by slender iron rods, which remain in the perfected casting as part of the same. The material of the cores is disintegrated and removed in the usual manner, by stirring it with rods inserted through holes of quite moderate size, left for the purpose in the side plates.

A car wheel of any approved variety may be contemplated as one of the most elaborate and successful efforts of man to produce a casting which shall be hard as flint to resist wear, light to diminish the destructive effect on the track, and sufficiently strong to sustain immense loads under circumstances where a sudden break would be fatal to a large number of individuals.

Proportions of Machinery.

That "a machine is no stronger than the weakest part," is an adage familiar to every well-informed mechanic, and one the truth of which will be self-evident even to the most stolid, with a little reflection. All the superabundant strength and consequent increased weight in any of the parts over and above that necessary to make them conform in strength to the other parts, is not only useless, but positively injurious—in many cases seriously so. In all very quick moving machinery—rapidly vibrating levers for example—or parts exposed to jerks and percussive strains, a surplus of weight in the moving part is a serious evil, and, in general terms, it may be said to be the highest effort of the designer to proportion the strength of every part to the strains so nicely that the whole machinery, and every part of every individual detail thereof, may be just as likely to break in one point as in any other. This is perfect proportioning; and although it is, from variations and uncertainties in the quality of all materials, impossible ever, except by chance, to attain perfectly to such a condition, every effort at proportioning should tend in that direction.

So far, we have referred entirely to what may be termed perfect or finished machinery, but there are many cases where, in experimenting merely—a business in which inventors are always supposed to be more or less engaged—the parts are exposed to unknown and unmeasurable strains; and we commenced this article solely to make one suggestion with regard to such operations, and that is, that some detail of little importance should, in such cases, always be made lighter and weaker than the rest, so that if the machine breaks anywhere, it will break at that point, and be very easily repaired. The thought may, perhaps, have occurred naturally to many, but we believe it has not been heretofore known to the majority. A good place to introduce such weakness is in some part secured by a single bolt or pin—for example, in a knuckle joint. The design is simply to make the fracture occur, if at all, at some point most easy of repair; and it is difficult to imagine anything simpler, on an elaborate machine than a simple bolt or pin.

It must be understood that this is but a temporary expedient, one adopted on first starting a new and untried device, as a prudent precaution against accidents which it is impossible to foresee. After having the advantages once pointed out in this manner, we think few mechanics will venture on starting a costly and untried machine under full power without adopting it. Whether the machine be a saw-mill or a dredger, a punching, shearing, or pressing machine, or any other device involving considerable strains, there is no predicting, with absolute certainty, what parts may jam and become displaced, and what extraordinary and unheard of strains will come upon the mechanism, which a little practice in both fitting up and operating will effectually avoid. Make a perfect novice "chief engineer" in attending even a fully perfected machine of any elaborate and delicate character, and there is a strong probability that it will break down in an hour, from some cause or other; yet even the inventor is almost as great a novice when he first starts a machine, on the bare construction of which he may even have wrought with great care for months.

Machine for Splitting Logs.

We have received a letter from Mr. John C. Gore, of Monterey, Cal., in which he inquires for a machine to split logs, asking whether such a machine has ever been invented, and if so, where it can be purchased. He says:—"It is impossible to split many of our logs by hand; and such a machine is much wanted here."

We believe there is no such machine in use. No doubt logs can be split on the very same principle as blocks from which staves and shingles are split; but then it would require immense and powerful machines and engines to do the work.

Death of Dr. Scoresby.

Rev. Dr. William Scoresby, F. R. S., formerly a navigator of distinction, and later a clergyman, author and savan, in which latter capacity his name is familiar to our readers, died on the 21st of March. He was a native of Whitby, in Yorkshire, England.

Sardines.

We annually import great quantities of this delicious fish from Europe, for which we pay extravagant prices, and yet they are found in great abundance on our coasts.

California Raisins.

We learn from our California exchanges that some boxes of raisins have been produced in Sacramento by M. Smith, of that place. They are the first raisin product of the Golden State.

A Good Throw.

The Adrian (Mich.) *Watch Tower* states fire engine No. 1 of that place, recently threw a stream of water out of the open *butt* through fifty feet of hose, a distance of 72 feet. It was built by Jeffers & Co., Pawtucket, R. I., and manned by 38 men.

The gold fields of Australia are said to be yielding at the rate of nearly one hundred million dollars per annum; the produce of the first three months of 1856 was nearly seven hundred thousand ounces.

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Water and its Phenomena.

(Concluded from page 254.)

In the Island of Iceland there are a number of boiling springs called Geisers, which have always been considered among the greatest wonders of the world, and many explanations of their peculiar action have been suggested by men of science. The following description of them is from the *Westminster Review*:—

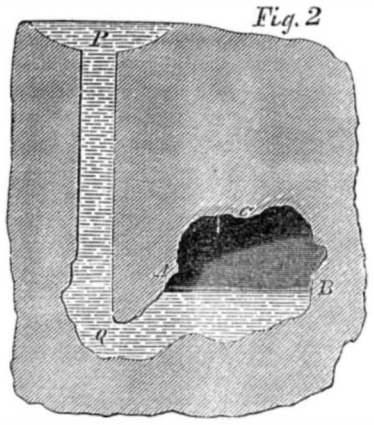
"The Great Geiser is the largest of these springs. It consists of a tube seventy feet deep and ten in diameter, which expands at its summit into a basin measuring fifty-two feet across from north to south, and sixty feet from east to west. Both the tube and the basin are lined with a smooth coating of silica, so hard as to bear the blows of a hammer without breaking. We find silica the substance which lines the tube, dissolved in the water in considerable quantity. Let us now imagine the case of a simple thermal spring charged with silica, whose waters flow down a gentle incline. The water thus exposed evaporates quickly, deposits its silica, and gradually raises the side over which it flows. The outlet is shifted to another position; this becomes elevated in its turn, and thus the stream, by erecting obstacles in its own way, has to travel round and round, depositing its burden as it moves along. This process continues until, in the course of ages, a shaft is formed, and we have the wonderful apparatus whose dimensions are given above. A brief inspection of the vicinity is indeed sufficient to show that the spring is capable of building its own tube. The mouth of the Great Geiser is on the summit of a high mound, formed by deposits from the spring. But in raising this mound, the spring must also have formed the tube which perforates it, and thus we may satisfy ourselves that the spring is the architect of the shaft in which it lodges.

Let us now examine the observed facts. Imagine a traveler arriving at the Geiser, and finding the tube and basin filled with hot water. He hears at intervals explosions which shake the earth beneath him. Immediately after each explosion he observes the water in the basin of the Geiser to be agitated; the liquid column is lifted to a hight of five or six feet, thus producing an eminence in the centre of the basin, and causing the liquid to overflow its rim. These elevations of the column are like so many unsuccessful attempts at an eruption. The traveler waits: the explosions and consequent agitation of the water in the basin become more frequent; at length an apparently convulsive struggle takes place; jets are cast up in succession; the Geiser seems to gather strength, and finally the display is concluded by the projection into the air of a mixed column of steam and water, which sometimes reaches a hight of one hundred and fifty feet.

The hight attained by the jets was accurately measured in 1846 by M. Sartorius von Waltershausen. At 11 o'clock A. M., on the 5th of July, an eruption occurred which threw up jets to the hight of a hundred and fifty-five feet; and on the 14th of July, at a quarter past 3 o'clock A. M., jets were projected to a hight of one hundred and sixty-one feet. These hights were properly determined by a theodolite, and may therefore be trusted.

Sir George Mackenzie submits the following theory of the Great Geiser, 'formed on the spot while the phenomena were before him:'—'A column of water is suspended in a pipe by the expansive force of steam, confined in cavities under the surface. An additional quantity of steam can only be produced by more heat being evolved. When heat is suddenly evolved and elastic vapor suddenly produced, we can at once account for explosions accompanied by noises. The accumulation of steam will cause agitation in the column of water, and a further production of vapor. The pressure of the column will be overcome, and the steam escaping, will force the water upwards along with it. Let us suppose a cavity, A B C D, communicating with the pipe P Q, filled with boiling water to the hight A B, and that the steam above this line is confined so that it sustains the water to the hight P. If we suppose a sudden addition of heat to be applied under the cavity C, a quantity of steam will be produced, which owing to the great pressure, will be evolved in starts, causing the noises like discharges of artillery, and the shaking of the ground. The pressure being now greatly increased, the

Fig. 2



water must rise out of the pipe; an oscillation is produced; the water is pressed downwards from A to Q, and the steam, having room to escape, darts upwards, breaking through the column, and carrying along with it a great part of the water.'

This theory of the Geisers maintained its hold upon the public mind from 1811, when it was published, until 1846, when MM. Bunsen, Sartorius von Waltershausen, and Descloizeau visited the Island.

Soon after his return to France, M. Descloizeau published his 'Physical and Geological Observations on the principal Geisers of Iceland.' The explanation which he gives of these eruptions is substantially the same as that of Sir George Mackenzie.

Let us now inquire whether a deviation from the theory of Sir George Mackenzie involves the assumption of 'a complicated system of pipes and cavities,' which he considers necessary. Not only is this not the case, but it will be seen that the hypothetical cavern imagined by Sir George may be wholly dispensed with, the Geiser tube itself being the sole and sufficient cause of the phenomena. Bunsen has proved this; and the history of modern science can furnish no more successful application of the laws of physics than that exhibited by his theory of the eruptions of the Icelandic springs—a theory by which are explained phenomena whose obscurity puzzled philosophers as much as their grandeur excited their astonishment. By the immersion of suitable thermometers at various depths, Bunsen, in association with M. Descloizeau, made himself accurately acquainted with the conditions of the temperature of the Geiser column. A series of such observations was made at twenty-three hours thirteen minutes, and at five hours thirty-one minutes, and at ten minutes before a great eruption; and it was found that the temperature of the water gradually increased as the time of eruption drew near. It was also found that the temperature of the column gradually increased from top to bottom. But at no portion of the Geiser tube had the water reached its boiling point at ten minutes before the eruption. We do not here mean a temperature of 212° ; for this is the temperature at which water boils when subjected to the pressure of a single atmosphere. What we mean is, that at no point of the tube did the water attain the boiling temperature corresponding to the pressure exerted at that point. Thus, the water at the bottom of the tube was found to be far above 212° Fah.; but here it had not only to bear the pressure of the atmosphere, but also that of a superincumbent column of water seventy feet in hight. The temperature of the liquid at the bottom of the tube was actually 16° Fah. less than that at which it could boil under the pressure there exerted.

Another fact of the greatest significance resulted from these observations. It was found that at a hight of thirty feet above the bottom the water approached more nearly to its boiling temperature than at any other point of the column. The observed temperature here was 252° Fah., the boiling temperature 255°. Consequently, immediately before an eruption, the water at thirty feet above the bottom of the tube was heated to within three degrees of the temperature at which it would boil under the pressure exerted upon it.

But if the water of the column attains at no place its boiling temperature, how can we account for the detonations, and the periodical upliftings of the column noticed by all travelers? The Geiser tube is fed by ducts which ramify through the hot volcanic rocks. In these ducts steam is generated at intervals with almost explosive force; the vapor rushes into the Geiser tube, raises the column in the manner described, and is condensed by the cooler water. To make good the amount of heat carried away by this steam time is required, and thus intervals occur between the detonations. This is a phenomenon common in the thermal springs of Iceland—the steam bubbles varying in size and the detonations in intensity with the nature of the spring. Let us now inquire what the effect of one of these bubbles *must* be, if it enters the tube when the temperature, at thirty feet above the bottom, is within three degrees of the boiling point. The inquiry will be simplified by reference to a figure.

Let A B be the Geiser tube, surmounted by its basin. Let *m* be a stratum of the liquid at thirty feet above the bottom of the tube. Owing to the heat locally imparted, this stratum is heated to within three degrees of its boiling temperature. Independent observers record that, by the entrance of the steam from the ducts at the bottom, the column is lifted 'some metres.' Let us suppose

Fig. 3

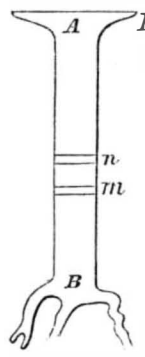
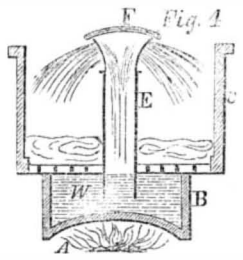


Fig. 4



that the elevation is six feet, which is certainly under what is often observed. Imagine, then, the stratum of liquid at *m* to be lifted six feet to *n*; at this point the pressure upon it is less than it was before, and under this diminished pressure the heat which the liquid possesses is actually more than a degree above its boiling point. This excess of heat is immediately applied to the generation of steam, which, in its turn, lifts the column higher, and diminishes still more the pressure on the lower portion; a fresh quantity of water will therefore be converted into vapor, which tosses the column still higher. Thus further relieved, the entire mass of water in the lower part of the tube suddenly bursts into ebullition, projects the column upwards, and we have the grand finishing display of the Geiser eruption.

If, as Bunsen himself observes, we compare this theory with the old hypothesis of the Geisers, we can scarcely comprehend how the latter could retain its place so long in science, since it is impossible to overlook the evidence against it furnished by every eruption. The idea involved in the hypothesis of subterranean caldrons supposed to be alternately filled with vapor and with water, is totally irreconcilable with the simple fact, that the quantity of water cast, during an eruption, beyond the margin of the basin, corresponds exactly with the depression of level that immediately follows, and, consequently, the supposed retreat of the water into an imaginary subterranean cavern, has no foundation."

This theory of Professor Bunsen is undoubtedly the correct one. By an apparatus in common use, the same phenomena is daily witnessed in calico print works and cloth bleaching establishments. Fig. 4 is a vertical section of a "bouking keer," (vomiting boiler,) employed for boiling *green* cotton cloth, in the preparatory process of bleaching. It exhibits the same action exactly as the Geiser springs, namely, an intermittant series of water eruptions through the central tube. A is a fire under boiler B; a keer or curb of wood, C, is secured on its top; D is a false perforated bottom, with a pipe, E, secured in its center, and communicating freely with the water, W, in the boiler; F is a cap on pipe, E, supported by small rods; G represents the cotton cloth on the keer, resting on the false bottom. In this apparatus the cotton cloth is submitted to the bouking action for several hours. The pressure of the column of water on the lower stratum of water in the boiler generates a high degree of heat, an eruption takes place, the hot liquid rushes violently up through pipe, E, and is forced by cap, F, as represented in the figure, in a shower over the goods, and is thus partially cooled; then it percolates down through the goods into the boiler, B, reducing the temperature of the water, and the eruption ceases until more heat is generated, when another takes place, exactly as Bunsen has described the action of the Great Geiser. This proves that the most simple theories of natural phenomena are always the most correct and scientific.

In the Napa valley, California, there are numerous Geisers, some of them, it has been stated, as wonderful as those of Iceland, and no doubt they are caused by similar operations of nature. The question may arise, where is the heat obtained which is the principal cause of this phenomena? In the Napa valley Geisers there is a great amount of sulphur found in the water. The action of water upon sulphur pyrites causes great heat, and this is sufficient to account for its source, which is also corroborated by the great heat of all mines containing pyrites and much water.

P., of R. I.—It is practicable to put a hydraulic ram in the cellar of your house, and throw water to the second story, by a fall of eight feet from your well. If the second story of the house is 24 feet high you will lose more than two-thirds of the water. We do not advise you to put the project into effect

A. M. D., of Pa.—Lithographic prints can be transferred to wood by steeping them for a short period in an alkaline solution such as a little potash dissolved in water, then pressing them on the dry wood, with the face of the print against the wood. The alkali softens the ink of the print, and the dry wood absorbs it from the paper.

D. H. H., of N. Y.—Parry & McMillan, Philadelphia, are the publishers of Morfitt's work on soap and candles. Lindsay & Blakiston, of the same city, are the publishers of Kurten on Soaps. These are the only two works with which we are acquainted that are published on the subject of soap in our country. H. B. J., of N. Y., is also referred to these two works.

W. C. G., of Tenn.—Write to some of the parties who have advertised in our columns as builders of water-wheels, and state your object clearly. A good Jonval wheel (center-vent) we believe will answer your purpose completely.

W. A. A., of Pa.—You must show that the substance you claim is different from other substances employed for the same purpose. By informing us wherein the tar you employ differs from other kinds used for similar purposes, we will be able to give you a more definite answer.

E. G. C., of Iowa.—By saturating your boards in a tank containing a solution of the sulphate of copper they will endure three times longer, if buried in the ground, than boards not treated in this manner. Dissolve one pound of the sulphate of copper for every five gallons of water required to cover the boards, and keep them under the liquor for six days, by stones placed upon them. They are then to be taken out, dried in the air, and are fit for use.

J. H. & P. M. S., of Md—If you run your circular saws with a greater velocity they will, no doubt, accomplish more work. Try an experiment with one of your saws and convince yourselves.

J. W. of N. J.—Your steam boiler, 20 feet long and 3 feet in diameter, with return flue, should raise steam enough to drive an upright and a 20 inch circular saw. Your grate may be too near or too far from the bottom of the boiler for burning slabs and saw dust. The fault, we believe, will be found in the setting of it.

W. W. H. M., of N. Y.—Your plan to determine latitude at sea, by a needle and scale of degrees showing its dip, assuming it to be horizontal at the equator, is not patentable, because it could not affect the object. The dip of the needle varies at different parts of the equator.

J. P. P., of Pa.—Send sketch and description of your churn, and do not be ashamed to give us your name.

——, Cummington, Mass.—Some correspondent from this town writes for information about business, but fails to sign his name to the letter.

Wm. B. Guernsey, of Norwich, N. Y., wishes to purchase a magnetic-electro engine of about the power of one man. Who can supply him?

A. B. H., of Phila.—Paper is now manufactured in large quantities from salt meadow grass.

J. A., of Ind.—You will find it more economical to employ two steam boilers 22 feet long and 42 inches in diameter, with 15 feet flues, than one boiler 32 feet long and 44 in. diameter, with 16 feet flues. Ten horse power will drive a run of 4 feet stones easily, at the rate of 200 revolutions per minute.

J. R. K. & Bro., of Geo.—The recipes for dying to which you refer are as applicable for yarn as cloth. Partridge & Co., Gold st., this city, is a good house to obtain dyestuffs.

L. B. S., of Vt.—A law has not yet been enacted to allow Yankees to take out patents in Canada. Red spruce logs, we have been informed, endure much longer under ground than those of red birch, and are, therefore, preferable for water pipes. In building cellar walls in clayey ground, so as to protect them from frost, you should ex-

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cavate a space around the walls, coat the latter outside with hydraulic lime, and then fill around them with common mold - loamy soil. We prefer filling between the studs of a house with mortar, to sheathing the walls with tarred paper, but the latter is best for preventing dampness in the walls.

E. R. W., of Me —When albumen is employed to neutralize arsenious acid taken into the stomach, it forms with it a new inert compound which is indigestible.

E. W., of Mass.—At the period when Focault's pendulum experiments caused so much excitement, we received innumerable articles on the same subject as that contained in your letter. Some of them contained diagrams, written by pencils on the ends of the pendulums, showing the various motions.

W. F. C , of Mass.—By mixing India rubber with shell lac and the carbonates of magnesia and fine charcoal powder you will obtain a hard product resembling hern when it is vulcanized. Gutta percha can be made equally as hard.

R. E., of N. Y.—Wicks of candles are now prepared which do not require snuffing; but if your improvement in candles posesses only one half the merits described in your letter, it deserves a patent. If we knew in what the improvement consisted, we could give you further advice.

W. M. H., of Md.—It would not be proper for us to publish the remarks in your letter, although we believe they are just, in reference to the conduct of the journal you have named.

J. C., of Mo.—Clothes may be dried in the same manner that bread is baked in a revolving oven, by employing a common endless flat belt, with carrying arms to retain the clothes. Drying machines are manufactured by John Worsley, Providence, R. I.

G. O. B. & Co., of Ala.—We have seen bituminous coal employed for burning brick in the same manner that wood is used, only the fire spaces were very close together. Bituminous coal will burn in an open grate out in the open air. Try an experiment, and if carefully performed, you will find the result as we have stated.

T. W. H. of N. Y.—It requires nearly as much power to draw a railroad car with large as with small wheels; if they are moved with the same speed. See remarks on car wheels in another column.

W. H. E., of N. Y.—The article to which you refer as having been puffed in some papers for mixing with paint, under the name of Oleum and Hydroleum, is "unformed soap"—that is, oil mixed with an alkaline lye, without boiling. It will mix with paint, and answer well for thinning it, but at the same time render it less durable. It is only a cheap substitute for turpentine.

J. M. W., of N. Y.—The latest treatise published on electro-magnetism, is by Professor Noad, of London. It can be obtained from H. Balliere, 290 Broadway, this city. We do not know where you can obtain an account of Davenport's Electro-Magnetic Engine. Insulated copper wire for making electro-magnets, No. 15, costs one dollar per pound—the finest kind three dollars per pound—sold by Pike & Co., Broadway, this city.

S. B., of Ohio.—Glass and ivory are non-conductors of electricity; but none of them are suitable to prevent a magnet attracting a piece of steel as you propose, because you do not insulate the magnet, nor place it at a sufficient distance from the steel to obviate attraction on the one side.

A. C. R , of La.—"Certain chemicals" do not produce certain colors on flowers; it is their arrangement in the form of minute crystals which reflect the various colors in a ray of light. Hunt's Photography, published by S. D. Humphrey, this city, is a good work for your purpose.

A. J., of Mich.—A little alcohol in ink prevents it from molding. A strong solution of gum arabic answers very well for pasting map paper on muslin. The best varnish for maps is made by dissolving Canada balsam in pure turpentine. No person can use a patented article in any place without the consent of the person who owns the patent right for that place; but you are not liable to be sued for selling patented articles in your district—for which you own the Patent Right—to a person living in another district. It is your duty, however, to inform the person purchasing that he cannot use the article without the consent of the owner of the patent right for his district.

D. G., of Pa.—The turbine wheels used at Lowell give a greater per centage of the water power used than any other with which we are acquainted, but we are partial to the overshot wheel under high falls. Ross's conical mill, manufactured in this city, has a good reputation.

J. H. F., of N. Y.—The rise and fall of the mercury affords no test of the weight of damp and dry air. The only way to decide which is the heaviest, is to weigh a certain quantity of each in a chemist's balance.

W. S & Co., of Ky.—By the experiments of the French Academy, it required a steam pressure of 50 atmospheres —750 pounds on the square inch—to produce a temperature of 510° deg. of Fah., and if we allow of an increase of 5 deg. for every ten pounds extra it will require a pressure of about 800 pounds to produce a temperature of 600 deg.—the heat you want.

S. H , of Phila.—We shall attend to the philosophy of bean vines climbing up poles during the summer season, and give such attention to this momentous question as its importance demands. You allow 8 horse power for driving one run of four feet stones, 150 revolutions per minute, with their attendant machinery. In giving advice respecting the power required to drive machinery, we always advise the use of an engine of somewhat greater power than the amount actually required.

M. T. K., of —— Your quotation from Bailey's Dictionary of 1730, describing a loadstone telegraph, is a translation from the Latin poet Lucan. He appears to have seen a vision of the signalling telegraph of Wheatstone three hundred years before it was invented.

O. B. D., of Ct.—The tides are caused by the attraction of the moon. The philosophy of this is very clearly explained in all elementary works on astronomy. It has yet to be discovered that the earth is retarded in its axial motion by the moon.

R. K., of Pa.—The common black oxyd of manganese boiled with linsed oil acts as a drier; so we have been informed, Communicate with Nelson Barlow, of Newark, N. J., regarding the sawing and planing mill.

J. J. W., of Ill.—Use sal-ammoniac as a substitute for "sig," it is the best we can recommend. Gregory's Chemistry, published in two volumes, by A. S. Barnes & Co., his city, is a good elementary work, and may answer your purpose.

A. F., of Ohio.—We believe you can maufacture your own gas for less than $3·20 per 1000 cubic feet. Coal is the cheapest material for gas in this city, but resin, and perhaps rosin oil may be cheaper in Chilicothe for your purpose. Communicate with J. A. Bruce, Baltimore, Md., Portable Gas Works.

W. H, of Wis.—We have received the model of your improvement by the hand of J. H., Jr., and it appears to be a novel affair. We do not know of any objection to its practicability, but of course this can only be fairly demonstrated by actual trial.

U. & Co., of N. J.—The Italian rye grass raised on Lord Derby's estate was not hay, but grass—green crop. Try and beat farmer Wilson.

Money received at the Scientific American Office on account of Patent Office business for the week ending Saturday, April 18, 1857:—

B. A. A., of Ind , $30; J. R. H., of Me., $30; A. T., of Mich., $30; S. H. W., of O., $30; J. W. F., of Conn., $30; J. C. M., of N. Y., $30; J. H. C , of Ill., $60; A. E. M., of N. Y., $27; F. G. H., of N. Y., $25; C. T. S., of Mass., $10; B. F., of Mass., $15; T. E., of N. Y., $30; A. A., of Del., $20; J. M. H. of Ill., $23; R. S., of Mich., $25; H. A. D., of Pa., $25; H. G. A., of Cal., $5; E. A. S., of Pa., $90; B. I. L., of Mass., $30; J. S. B., of N. H., $379; D. P., of Ala., $60; J B., of Ill., $25; G. L. C., of N. Y., $30; W. D. Jr., of Pa., $250; H. R. W., of Ky., $25; J S., of O., $23; J. N. W., of Ill., $25; L. E., of Mich., $30; W. S., of N. H., $20; C. P., of N. Y., $25.

Specifications and drawings belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, April 18, 1857:

H. G. A., of Cal.; J. V. J., of Ill.; R. P , of Conn.; F. G. H., of Mass.; B F., of Mass.; C. P., of N. Y.; A. E. M., of N. Y.; H. A. D., of Pa.; S. & L., of Wis.; J. M., of Miss.; J. S., of O.; H R. W., of Ky.; P. K., of R I.; J. B., of Ill.; L E , of Mich.

Literary Notices.

YOUNG MEN'S MAGAZINE.—Richard C. McCormick Jr., aided by Rev Dr. Hague, Alfred B Street, Professor H. Crosby, Rev. T. L. Cuyler, Wm C Langdon, and others, proposes to commence a monthly journal on the 1st of May bearing the above title. It is intended to make the work a complete repertory of whatever is most useful and agreeable in the movements of young men in every honorable sphere and relation of life, and to steadily exert upon the public a healthful and moral influence, improving the character no less than pleasing the taste. Especial attention will be given to the transactions of Young Men's Societies and Associations, (both religious and secular,) so numerously existing and multiplying throughout the world; and it is confidently believed that, in this connection, much interesting and valuable information, not attainable through any other medium, will be presented from month to month. Office 348 Broadway, New York.

GREECE AND THE GREEKS OF THE PRESENT DAY—By Edmond About. New York: Dix, Edwards & Co. This book is a 12mo., and contains with the appendix about 350 pages It is well written, and furnishes much entertaining and instructive matter in reference to the present state of that classic ground, whose ancient story is so thrillingly interesting to all It treats of the country, the men, agriculture, industry, commerce, social life, government and administration, religion, finance, the King and Queen and Court, society, &c. Each of these subjects is handled tersely and in a vigorous manner.

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GAS ENGINEER—The advertiser, a man of considerable experience in the manufacture of gas apparatus, wishes an appointment to make or erect, either in part or whole of apparatus for gas works. Also understands thoroughly the manufacture of gas from the retorts to the supply. Will undertake the management of a gas works, having had the lighting of several towns on his hands. Can also make working and finished drawings. No objection to the country. Address M. W., 1429 Callowhill st., West Broad st., Philadelphia. 32 2*

MOUNT HOPE IRON COMPANY CUT NAILS The attention of dealers and shippers are requested to this new and superior brand of Cut Nails, made at entirely new works, with latest improved machinery. They are excellent in shape, finish and quality, for sale by the Company's agent, JOHN W. QUINCY, 93 William street. 29 8*

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Science and Art.

The Steamship Great Eastern.

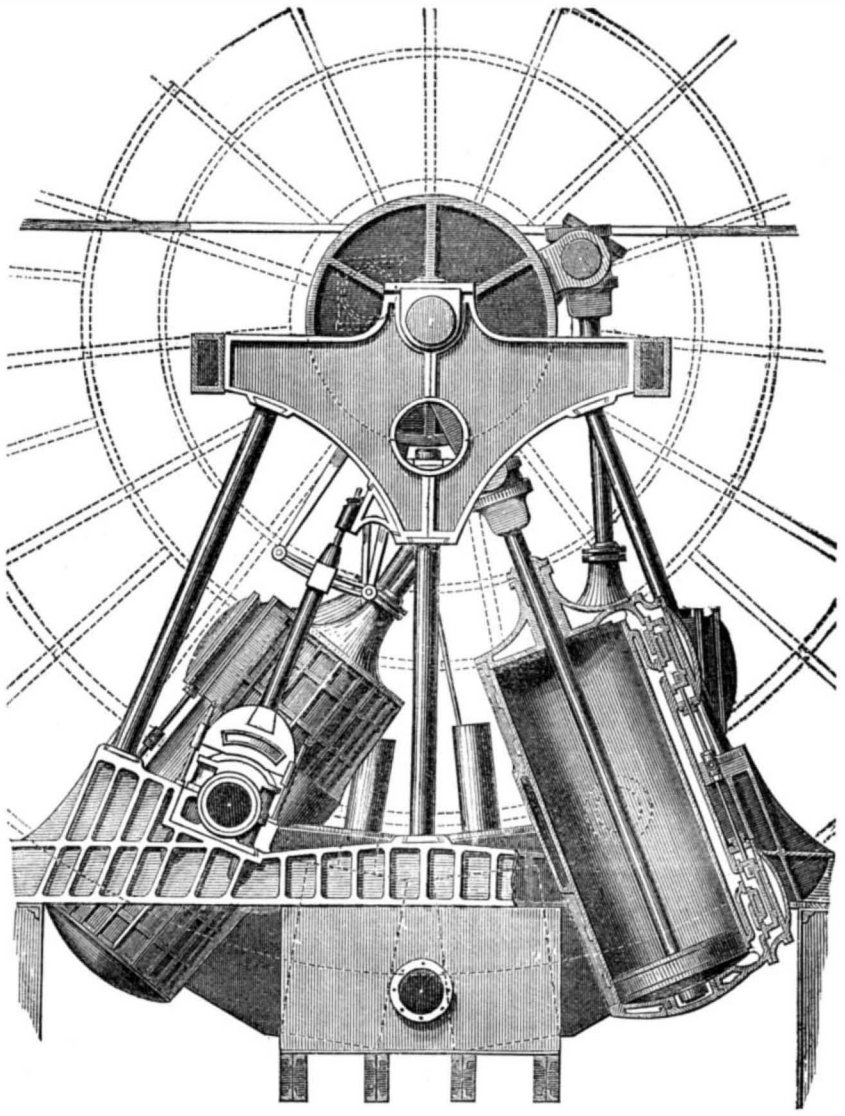
Two Brunels have become distinguished as engineers—Mark Isambard, deceased, and Isambard Kingdom, his son. Both have distinguished themselves for the originality of their enterprises, neither preferring to follow the beaten track, and both have been very generally successful in carrying out their novel and extraordinary undertakings.

The *Great Western*, the first regular steamship between New York and Liverpool, the general design and arrangement of which is credited to the younger Brunel, was 50 feet longer and 8 feet wider than the largest steamer before afloat; but the giant of 1838, measuring 236 feet in length and 35 feet 6 inches in breadth, has become a pigmy in comparison with the succeeding developments in that line.

Other things being equal, vessels move faster through the water in proportion as their size increases. We do not recollect the precise ratio, but it has been ascertained by experiment and observation with considerable care for some kinds of vessels, and in yatch-racing, for example, allowance is always made for the size, assuming that the largest yachts will sail perhaps some 25 per cent. faster than a medium-sized one, built and rigged in the same proportion. This fact favors the large steamers; and in or about the year 1853 the fact that common steamships could not successfully compete with fast-sailing clippers on the long voyages from England to Australia, on account of the expenses and delay incurred in coaling at various intermediate points, induced Mr. Brunel to undertake the designing of a ship of sufficient magnitude, and of such proportions that she might accommodate an immense number of passengers, and take an almost infinite amount of freight, and yet travel at a fair speed, with a sufficient quantity of coal to supply her for a whole voyage out and back—a distance of 25,000 miles. The Eastern Steamship Company, undertook the practical working out of the idea. John Scott Russel & Co, at Millwall, on the Isle of Dogs, in the Thames, contracted to build the iron hull, and James Watt & Co. the engines. The first plate of the hull was laid in May 1855. Russell & Co. have since failed, a fact which, with others, has delayed her progress; but her construction has since been taken in hand by her proprietors themselves, and she is now rapidly progressing. It is confidently expected that the immense leviathan will be launched in July or August of the present year, with her engines on board, and will make her first trip—called by some a trial trip—to Portland, Me., some time next autumn.

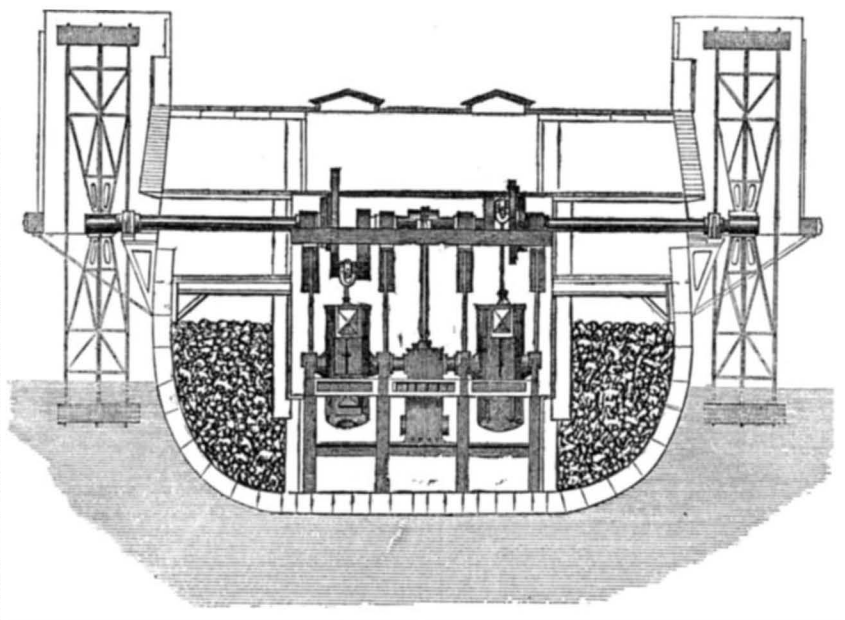
In the accompanying engravings, fig. 1 represents a side elevation of the paddle engines, with dotted lines for the wheels, and fig 2 a cross section of the hull reduced from what are undoubtedly tolerably accurate engravings published in the London *Artisan*, to which valuable engineering work we are indebted for several of the particulars of her progress. The ship is novel in several important respects, aside from her very extraordinary dimensions. The length entire is 680 feet—more than an eighth of a mile; the breadth, at the widest point, exclusive of the paddle boxes, etc., is 83 feet, and the depth, from the upper deck, is 58 feet. Unlike other vessels, whether of wood or iron, she has no keel, and strictly speaking, no ribs. The shell does not diminish in thickness or strength from the bottom upwards, like other vessels, but is of equal strength throughout, like an immense tube. The lower portion, however, up to a line eight feet above her deepest immersion in the water, is constructed of two thicknesses or shells 3 feet apart, the space between being traversed longitudinally by 33 continuous strong and water-tight partitions, thus forming 32 separate iron chambers, each provided with suitable cocks, by which it can be filled or emptied at pleasure, to maintain the proper trim, or to ballast the vessel. There are four decks, each of which strengthens the hull laterally, in the ordinary manner, and the whole structure is crossed by strong and water-tight partitions, each capable of resisting the full pressure of the water in case the hull should be damaged and either compartment filled. There are ten such transverse partitions, sixty feet apart, and the hull is, in fact, designed to be separable, by violence, into several separate vessels or sections; and in addition, there are, through a large portion of the distance, two longitudinal partitions thirty-six feet apart, and extending up to the lower deck. The main deck is also composed

THE PADDLE ENGINES OF THE GREAT EASTERN.



of two skins with ribs between them, laid longitudinally, like those in the shell, instead of transversely, the whole frame-work being designed mainly to resist longitudinal and hogging strains, instead of simple pressures from the sides, which latter are possibly most severe on short sailing vessels.

As it is not designed to make this ship an extraordinary vessel for speed, the power will be quite moderate in proportion to her tunnage; but it is, in the aggregate, very great. To concentrate it all in one engine, or pair of engines, either for paddle wheels or a screw, would involve considerable difficulty; the power of the *Great Eastern*, therefore, is divided, and the mass is impelled by both a pair of paddle wheels and a screw. The paddle wheels are to be fifty-six feet in diameter, and are to be provided each with twenty-eight paddles, thirteen feet in length and three in depth. These will be driven not simply by one engine, as is common on our



coasting steamers, nor again by two, as is common on most of our ocean steamers, but by four engines coupled in pairs, one pair for each paddle wheel; but the main shafts and wheels, though thus capable of working independently—so that one may be worked while the other is idle, or both may be worked in opposite directions if desired, Mississippi steamboat fashion—are to be coupled or uncoupled at pleasure by a strong friction clutch. These engines have each a stroke of fourteen feet—as great, we think, as any in the world, except the single one on our Hudson river steamer *New World*, which is fifteen feet. The diameter of each cylinder is seventy-four inches—considerably less than those of most of our large steamers. The engines are oscillating, with slide valves, and the general arrangement of each pair is shown in the engravings. These engines will work with a nominal power of 1,600 horses. These with the accompanying boilers, and the coal for the same, are located somewhat forward of the center of the mammoth hull.

The screw is twenty-four feet in diameter, with a pitch of thirty-seven feet. The propeller shaft is twenty-four inches in diameter. This will also be driven by four engines, to subdivide the power, and either may be disconnected at pleasure in case of disarrangement. Screw engines are necessarily of short stroke. These have a stroke each of four feet, while the diameter of the cylinders is eighty-four inches.

A detailed description either of the common or novel features of the ship throughout, the details of the engines and boilers, the pumps, the arrangement for steering, communicating orders, and performing all the various important and unimportant duties, cannot be compiled correctly from the scattered notices within our reach; and it is quite probable that the facts already given may be incorrect in some of the minor points.

There will be in all 22 engines, including all sizes: 4 for working the screw, 4 for working the paddle wheels, 2 for working the capstan, getting up anchors, and pumping out ship, 2 for revolving the screw (to prevent its creating resistance when uncoupled and the ship is working under sail and paddle wheels,) and 10 donkey engines or steam pumps, for filling up boilers. The large screw engines are also fitted with a separate steam cylinder, to aid in starting and reversing, which cylinder might almost be rated as a still additional engine.

The tunnage of this ship by our government measurement, would be about 22,000 tuns. The displacement of water, or the actual supporting capacity, will be about 27,000 tuns. The weight of the hull, rigging, and enginery will be about 7,000 tuns, and a sufficient quantity of coal for a full Australian voyage is estimated at from 5,000 to 6,000 tuns, leaving a clear capacity for freight of about 14,000 tuns.

If the very gigantic clipper ship *Great Republic*, the mammoth steamship of war *Niagara*, and the Collins' steamer *Adriatic*—at this date the largest steamship afloat—were each to be fully loaded and then transferred bodily, with their loads, into the hold of the *Great Eastern*, it would appear from the figures that the whole would make but a fair cargo for this novel craft.

We wish the enterprise the highest possible degree of success, as an experiment which will help to solve many questions relating to the practicability and profit of perhaps still larger constructions.

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